Classifying Saudi Students' Second Language Learning Strategies.

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Abstract

The purpose of this study was to explore the issue of strategies' classification with the Strategy Inventory for Language Learning (Oxford, 1990) to determine whether these strategies contribute to the proposed classification through confirmatory factor analysis. The investigation explored how each item loaded to the latent construct of various classification strategies in order to assist second language teachers and researchers for the purpose of facilitating second language acquisition. Moreover, this study was the first to explore and classify Saudi students' second language learning strategies and thus, offers a unique contribution to the literature. The results revealed that Saudi Students made moderate use of strategies as classified by Oxford (1990) in Model.6, which classified strategies into six categories; Memory, Cognitive, Compensation, Metacognitive, social, and Affective strategies. However, Saudi students were not consistent in their use of other classification strategies as proposed by Oxford in seven other models. Therefore, language teachers and researchers should be cautious about using it and drawing conclusions based on its outcomes.

DEDICATION

This dissertation is dedicated to my family and friends for their support. A special dedication goes to my parents, brother and sisters. You are the best parents a person could ever ask for. And to the love of my life, my wife and our two children, Abdullah and Riyyan. Thank you for your support.

Acknowledgement

Thank you, my Lord for helping me to reach this stage. I am incredibly indebted to so many people for the completion of this dissertation. First, I owe so much to Dr. Paul Markham, my dissertation chair, advisor and great supporter in this journey to establishing myself as a member of the academia. Dr. Markham, you have seen potential in me that I do not always recognize, and this allowed me to see beyond the immediate challenges of growing in academic knowledge and wisdom. In addition, I acknowledge the time, support and encouragement of Profs. Bradley, Frey, Rice and Dr. Peter, who as members of my dissertation committee and comprehensive exam committee have been fundamental to the path. Along with them, I acknowledge Prof. Jonathan Templin. Finally, I want to thank my family for their unwavering support. Thank you to my parents, brother and sisters for your love and for encouraging me to challenge myself. Above all, thank you to my wife, and my sons, Abdullah and Riyyan, for their sacrifices. Thank you to my friends and colleagues.

Contents

List of Tables

Appendix

List of Figures

Classifying Saudi Students' Second Language Learning Strategies.

Chapter I: Introduction

Many studies have been conducted to examine how Saudi students acquire English by targeting the language that was presented to these second language learners. Other scholars' explorations of student performance on language tests such as TOEFL or IELTS may shed some light on the complex process of second language learning. However, these studies neglect an important factor - the learner. Peter Strevens once stated, "It takes better teachers to focus on the learner." (Oxford, 1990). Based on this observation, this study will attempt to explore and classify the strategies used by Saudi students in their endeavors to learn English.

Teaching Second Language: From Language Centered to Learner Centered

The field of second language teaching has gone through two important phases. The first focused on how to present the targeted language to students, rather than focusing on the students themselves. This was the norm until the 1970s, when there was a shift from language presentation to the language learner. After this breakthrough, there were many scholars, such as Rubin, who began to focus on language learners in her seminal paper entitled *What the "Good Language Learner" Can Teach Us,* which was *published* in TESOL Quarterly in 1975. This pioneer paper eloquently illustrates this shift from language to learner. Twenty years later, Naiman, Frohlich, Stern & Todesco's work, (1996) *The Good Language Learner* in the series of Modern Languages in Practice, demonstrates that although Rubin was attempting to display to language researchers how the language learner is an important source of information concerning language teaching, researchers at the time did not consider this, which led to Naiman, Frohlich, Stern & Todesco's publication. During this period educators were studying the tactics of successful students in order

to help other learners to succeed in the quest of language learning. The first question researchers and educators attempted to answer was "Why do some learners excel in the difficult task Macaro (2006) of second language learning, and some do not?"

Individual differences in language learning fall into three of the following categories:

1- Learning Styles;

2- Learning Strategies;

3- Affective Variables, Ehrman et al. (2003).

In this paper, this study will focus on learning strategies. According to Macaro (2006), scholars from the 1970s into the early 2000s hotly debated this critical issue. Some of these publications are: Abraham and Vann (1987), Allwright (1990), Bialystok (1990), Biggs (1992), Brown (1991), Chamot and O'Malley (1990, 1996), Cohen (1998), Cohen and Weaver (1998), Dadour and Robbins (1996), Dornyei (1995), Ehrman (1996, 2003), Leaver et al. (1997, 2002, 2003), Little (1991), Nunan (1997), Oxford (1990, 1992, 1996, 2001), Oxford and Cohen (1992), Oxford and Leaver (1996), O'Malley et al. (1985), Park-Oh (1994), Paige et al. (2004), Pressley and Ghatala (1990), Rubin and Thompson (2004), Schmeck (1988), Schmitt (1997), Thompson and Rubin (1996), Wenden and Rubin (1987), Weinstein (1987) Weinstein et al. (1987, 1988), Zimmerman and Martinez-Pons (1986), and many others. In an attempt to find an effective approach, scholars began the difficult task of organizing and classifying these strategies. Nearly all the authors contradict each other, which makes it difficult for teachers to promote the use of strategies among their students to help them reach the autonomous learning stage in which students become less dependent on their teachers. At this point, the instructors act as guides for their students rather than the only source of information, (Benson 2013), Burns & Richards (2018) and Lamb & Reinders (2008). Reexamining the idea of contradiction in strategy classification is what

inspired the researcher to write this paper, In this study the researcher will examine and validate Strategy Inventory for Language Learning, abbreviated as SILL, and explore whether or not Saudi students conform to these strategies.

Strategies

The origin of the word strategy originates from the Greek term *strategia,* which, according to Oxford (1990), is the management of troops in wars. This indicates that strategies are intentional. According to Pressley and McCormick (1995, p.28), "Strategies must be controllable" which leads to a predictable end. Moving from the battlefield to the classroom, Oxford (1990, p. 8) defines learning strategies as "Operations employed by the learner to aid in the acquisition, storage, retrieval, and use of information." In addition, "It is specific actions taken by the learner to make learning easier, faster, more enjoyable, more directed, more effective, and more transferable to new situations." Specific to second language learning, Scarcella and Oxford (1992, p. 63) define L2 learning strategies as "Specific actions, behaviors, steps, or techniques -- such as seeking out conversation partners or giving oneself encouragement to tackle a difficult language task-- utilized by students to enhance their own learning." When a language learner becomes used to strategies to the extent that they become habit, he or she is not aware or conscious of using those strategies then it becomes a *process* (Cohen, 1998).

Weinstein and Mayer (1986) define strategy as "behaviors and thoughts in which a student engages during learning and that are intended to influence his or her encoding process." Chamot (1987, p.71) describes learning strategies as techniques, approaches or deliberate actions that students take to facilitate the learning and recall of both linguistic and content related information. For Wenden (1987, p.9) learner strategies refer to behaviors which students engage in to regulate

the acquisition of a second language. The author also states that students' strategies include what they know about the strategies they use, and their knowledge of aspects of their language learning. Cohen (1998, p.5) argues that second language learner strategies encompass both learning and use strategies. Other researchers have come up with a shorter definition such as Nisbet and Shucksmith (1986, p.68) who define learning strategies simply as "the processes that underlie performance on thinking about tasks." Masters, Mori, and Mori (1993) focus on cognitive rather than learning strategies. They refer to a definition of cognitive strategies coined by Alley and Deshler (1979) as "techniques, principles, or rules that will facilitate the acquisition, manipulation, integration, storage, and retrieval of information across situations and settings." They go on to say, "Cognitive strategies are a fundamental part of the process of acquiring knowledge as well as the skills of reading, writing, speaking, listening, note taking, questioning, vocabulary acquisition, time management, reasoning, problem solving, and memorization."

By using these strategies for language learning, a student becomes more autonomous in his or her language learning. This is a very important goal that all teachers wish for their students, because classroom learning is not enough due to limited time. This notion is in accordance with Vygotsky's (1978) idea that learning through social interaction with experienced users moves to a certain stage where a learner does not need help and could rely solely on himself or herself and becomes an independent learner. According to Cohen, students differ in their language learning strategies based on their proficiency levels (1998). Effective language learners may figure out which strategies suit them and their language goals, while less effective learners tend to be random in their use of strategies, which may hinder them from their goal. This illustrates the importance of teaching and presenting strategies to language learners. Teaching strategies that are clear and

appropriate for the task at hand yields a better performance by learners, Chamot et al. (1999), Cohen (1998) Feyten, Flaitz and LaRocca (1999), Oxford (1990, 1996) and Wenden (1987).

Research Questions

This study aims to answer the following research questions:

RQ. 1. Do Saudi university students use learning strategies consistent with SILL? Do all items contribute to one direction?

RQ. 2. Do Saudi university students use SILL learning strategies according to the sub-classifications of SILL?

RQ. 3. Do Saudi university students use learning strategies which are not included in SILL?

Significance of this Study

Although English language teaching began a long time ago in Saudi Arabia, the issue of learning strategies was not discussed in this context. The focus is always on the language presented to the second language learners and the four skills of reading, writing, listening and speaking. The Saudi context was following the research of teaching English as a second language in the global context. However, since 1970s and up till now, the research focus of second language learning shifted toward learners, while it is not the Saudi context. This ignites the idea of this paper. The paper is going to be in two stages: the first one is trying to validate Oxford's SILL scale at one point; While the second point, is trying to see whether Saudi students' strategies can be classified, according to SILL or they do not conform to what Oxford's scale is suggesting. This study is the

first research that examines the strategies' use of Saudi students within the context of English as a second language. Moreover, SILL has not been validated within the context of Saudi students.

Chapter II: Literature Review

The first chapter discussed how language teaching shifted from being language centered to being learner centered. It introduced strategies and how it is defined with references to the etymology of that word, and how it is defined in the field of second language acquisition. This chapter will look at literature of the history of second language learning strategies, learner use of strategies, teaching strategies, the neuroscience of strategies, language learning strategies classification and definition and strategies elicitation methods

History of Second Language Learning Strategies

Second language learning strategies were neglected for a very long time by second language learning researchers until the1970s. With the publication of Rubin in 1975, researchers began to examine the importance of strategies in second language learning. Since then many studies were conducted in this regard. In this section, There will be a review some of the major works that were carried out in this area. Previous research demonstrates that there is a relation between second language learning strategies and language learning. Some studies found a correlation between strategies use and successful second language learning such as, Oxford & Burry-Stock (1995). Nunan (1997) and Oxford and Nyikos (1989) found a link between high strategy use and motivation. Other studies found specific types of strategies that make successful language learners within certain parts of language learning such as Beaton, Gruneberg, and Ellis (1995), where they found a relation between vocabulary retention and the keyword strategy. Keyword strategy is according to Pressley, Levin and Delaney (1982) the case in which a second

language learner makes a link between unfamiliar foreign word and a similar word from his or her L1 with regard specifically to the sounds. In this case, L1 word is the keyword.

Gu and Johnson (1996) claimed that visual repetition "writing words repeatedly" correlates negatively with vocabulary size, whereas self-initiation and selective attention correlates positively with vocabulary size. Oxford & Burry-Stock (1995) found that successful readers utilize a group of strategies that help them uncovering the meaning of the targeted texts. Anderson (1991), Block (1986), Carrell (1989), and Devine (1984), Chamot & El-Dinary (1999), Graham (1997), Macaro (2001), O'Malley, Chamot, & Kfipper (1989), Sanaoui (1995), Vandergrift (1998), and Vann & Abraham (1990) found a relation between success in second language learning and using a combination of strategies. However, this use is accompanied with a good level of flexibility of utilization of these strategies. And more importantly students are aware of these strategies uses. So, they are using strategies flexibly and they know metacognitively what they are doing.

Learner Use of Strategies

Language learners use strategies differently, (Macaro, 2006). Ehrman & Oxford (1989) Macaro (2000) Oxford & Niykos (1989) and Sheorey (1999) found that girls use strategies more than boys, other studies such as, Bacon (1992), Bügel & Buunk (1996), and Gu (2002) found that girls use strategies in a different way compared to boys. Kim (1999), Koda (1990), Levine, Reves, & Leaver (1996), and LoCastro (1994) found that students from different cultures use strategies differently. Moreover, experience play an important role in using language learning strategies, according to De Larios, Murphy, & Manchon (1999), and Van Hell & Mahn, 1997). Kember & Gow (1994), and Porte (1997) stated that some less experienced learners use ineffective strategies. Other students may find it difficult to use strategies, Block (1986), Knight (1994), and Lee &

Schallert (1997). Lastly, Christianson (1997), and Porte (1995) stated that some students may use strategies, but in an inappropriate way for being less experienced learners of second language.

Teaching Strategies

Other studies support long-term teaching of strategies with second language learners that includes raising awareness toward metacognition part of strategy use. Conti, (2004) and Macaro, (2001) found that presenting strategies to second language learners help them in writing skills. Other studies by Cohen, Weaver, & Li (1995), and Nakatani (2005) found a positive effect for introducing strategies to second language learners in oral interaction and speaking skills in general. Avila & Sadoski (1996), Cohen & Aphek (1980), and Lawson & Hogben (1998) all found that teaching strategies help in improving vocabulary acquisition. Thompson & Rubin (1996) concluded that presenting or teaching strategies improves listening skills. Carrell, Pharis, & Liberto (1989), Fraser (1999), and Raymond (1993) stated that introducing strategies to students help them in improving their reading skills. Finally, other studies such as Flaitz & Feyten (1996), Kohler (2002), Nunan (1997), Sengupta (2000), and Victori & Lockhart (1995) suggested that strategy instruction enhances students' ability in general and leads them toward positive attitudes about second language learning.

The Neuroscience of Strategies

At this point, a shift is going to be made toward strategies and neuroscience; and the basic question is, where is the place of strategies? Researchers do so to help teachers in presenting strategies to students in an appropriate way. To know the place of strategies within brain there is a need to know how language learners utilize strategies in second language learning. Strategies require students' attention to do the required task, so language learners are aware of strategy use

which makes it a conscious activity, Macaro (2006). This makes it different from Ullman's (2004) declarative, "or the what of language" and procedural, "or the how of a language" linguistic knowledge, Salaberry (2018), and mental processes that language learners have no control over when using language, Baddeley (1997), Eysenck (1994), Libben & Jarema (2002), and McLaughlin (1990). Macaro (2006) suggested, in accordance with Kail and Bisanz (1982), Flavell, Miller & Miller (1993), and Rabinowitz and Chi (1987), that strategies are only actions to be performed by language learners, and these actions serve a certain goal that language learners are trying to reach. Language learning strategies are linked to the central executive part of the working memory, as devised by Alan Baddeley in his famous model of working memory (1997). Working memory according to Baddeley (1983) refers to "the temporary storage of information in connection with the performance of other cognitive tasks such as reading, problem solving or learning." Strategies are linked to central part of WM, which is according to Baddeley (1992) is defined as the central executive**,** that is assumed to be an attentional-controlling system. This can be seen in figure.2 adapted from Baddeley (2000). Working memory has been located through many studies in the prefrontal cortex area "figure.1", which is an area of the brain that is responsible for the executive function. Many studies have reached this conclusion with different explanations and views toward how WM is localized in this area, e.g., Cabeza & Nyberg (1997), Carpenter, Just, & Reichle (2000), Kane & Engle (2002), Smith & Jonides (1998), Wager & Smith (2003), Postle, Druzgal, & D'Esposito (2003), Curtis & D'Esposito (2003), Goldman-Rakic (1996), Owen, Evans, & Petrides (1996), Beardsley (1997) and Osaka, Logie, & D'Esposito (2007).

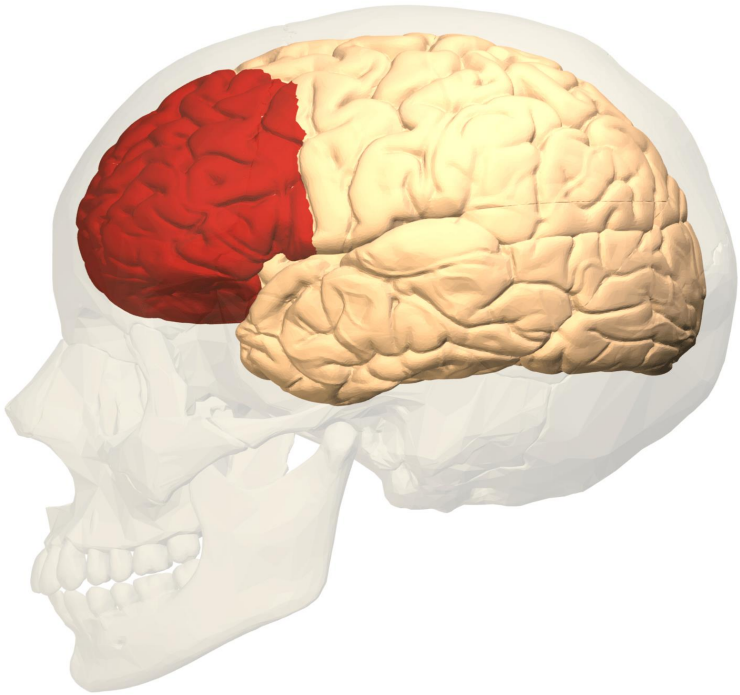


Figure.1 The red area is the Prefrontal Cortex of the left cerebral hemisphere as drawn by "BodyParts3D, © The Database Center for Life Sciences adapted from https://i1.wp.com/www.neuropsychotherapist.com/wp-content/uploads/2015/10/Prefrontal_cortex_left_-_lateral_view.png

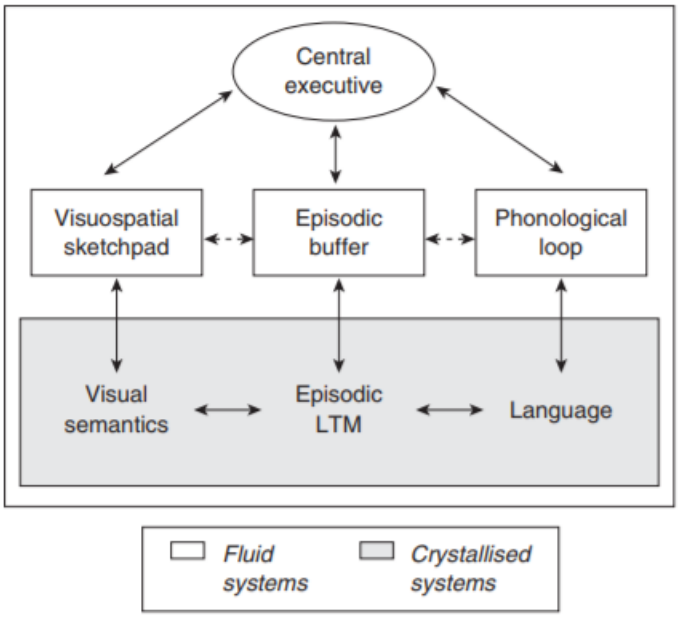


Figure.2 The revised model of working memory (Baddeley, 2000)

Takeuchi, Ikeda, and Mizumoto (2012) examined the location of working memory using an innovative neuroimaging technique called *near-infrared spectroscopy* (NIRS). The NIRS technique is used to estimate the changing levels of blood and oxygen, these levels are indicators of brain activity in the targeted area in the cerebral cortex, Kawaguchi, Ichikawa, Fujikawa, Yamashita & Kawasaki (2001). This team of researchers used an activity that requires deployment of certain language strategies in English and Japanese. Based on that, they suggested that the areas of the working memory represented by the prefrontal cortex were highly active when language learners used reading strategies attentively, irrespective of the used language, English or Japanese. The following figure "Figure.3" from this study illustrates the area of activation for the participants in this study, which is in the front part of the brain i.e. Prefrontal Cortex. This area is responsible for decision making, Gläscher, Adolphs, Damasio, Bechara, Rudrauf, Calamia, & Tranel, (2012).

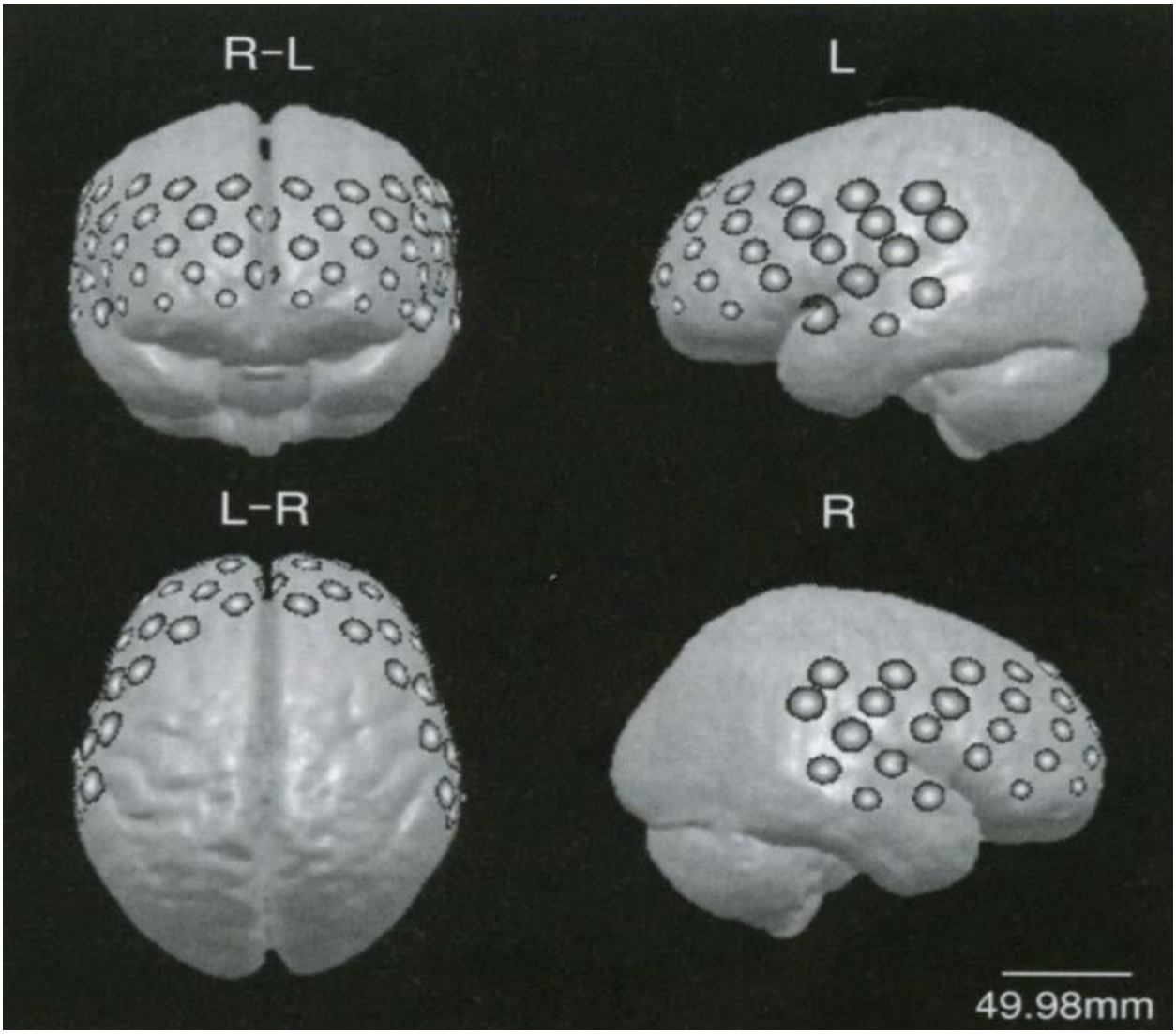


Figure.3 adapted from Takeuchi, Ikeda, and Mizumoto (2012)

In another study for Takeuchi, Ikeda, and Mizumoto (2012) with NIRS technique, they concluded in a two-part study that using reading aloud strategy, 'where students read the text aloud' in L2 reading results in higher degree of activation of the cerebral parts of brain in comparison to doing the same activity within L1. However, that effect disappears if the reading materials share the same level of difficulty in both languages. The researchers suggested that phenomenon can be attributed to the incomprehensibility of these difficult text that lead students to ignore processing these texts, which can be seen in the lowered brain cerebral activation. In the

second part of the study, they examined the effect of text difficulty in relation to the proficiency of second language learners with repetition of *reading aloud* exercises. They concluded that reading materials that suit the learners' reading ability in aloud manner result in more cerebral activation in the prefrontal areas of brain in comparison to more difficult materials that do not suit learners' reading ability even with read aloud manner. Moreover, repeating different types of reading aloud activities that require some cognitive demand increase the degree of cerebral activation and this is supported by many research, Demb, Desmond, Wagner, Vaidya, Glover & Gabrieli, (1995), Engstrom, Landtblom & Karlsson (2013), and Meyler, Keller, Cherkassky, Lee, Hoeft, Whitfield-Gabrieli & Just (2007). However, repeating the same type of reading aloud activity does not change the cerebral activity neither in decreasing or increasing manner.

Other studies such as White, Genesee and Steinhauer (2012) have found that P600 latency differences, which is a brain response that reveals processing syntactic difficulty, were modulated by the different uses of reading strategies. Cook, Pandža, Lancaster and Gor (2016), Rüschemeyer, Nojack, and Limbach (2008), Gor (2014) and Chrabaszcz and Gor (2014) stated that L2 learners utilize strategies to avoid language complexity. Weber, Kozel, Purgstaller, Kargl, Schwab & Fink (2013) found that spelling strategies were more helpful for second language learners regarding lexical retrieval in comparison to the phonological strategies and that was measured by *Theta* and *alpha* waves of Event-related desynchronization/synchronization. According to Pfurtscheller & Da Silva (1999) desynchronization/synchronization are simply other words for activated and deactivated areas of the cortical parts. Patricia Kuhl (2004) suggested that infants use strategies in acquiring their L1 sounds and that makes it easier for them to learn language. Otherwise, their acquisition will be difficult and slower. Hattie and Donoghue (2016) carried out a meta-analysis of studies that targeted learning strategies and concluded that strategies should be taught to

students and they should be aware of these strategies, so they can use them correctly and according to their needs.

Language Learning Strategies Classification and Definition

The evident problem within second language strategies is the issue of definition and classification, Oxford and Cohen (1992). The first point of disagreement is classifying direct and indirect strategies. Table.1 demonstrates how Rubin (1981) and Oxford (1990) differed in classifying direct and indirect strategies. They are different because their definition of direct and indirect strategies is dissimilar from the beginning. Classification and verification strategies are direct in Rubin and indirect in Oxford. Table.2 displays a comparison between O'Malley and Chamot (1990) and Oxford (1990), which presents more area of overlap between the two classification systems with some areas of disagreement. The last two systems of O'Malley and Chamot (1990) and Oxford (1990) appear somehow similar in comparison to the first two Rubin (1981) and Oxford (1990), which are dissimilar.

TABLE 1
A Comparison of Rubin's and Oxford's Strategy Classification Systems

Rubin (1981)	Oxford (1990)
Direct Strategies	
Clarification/Verification	Indirect Social Strategies
Monitoring	Indirect Metacognitive Strategies
Memorization	Direct Memory Strategies
Guessing/Inductive Inferencing	Direct Compensation Strategies
Deductive Reasoning	Direct Cognitive Strategies
Practice	Direct Cognitive Strategies
Indirect Strategies	
Create Opportunities for Practice	Indirect Social Strategies
Production Tricks	Direct Compensation Strategies

Note. This comparison is not always clear-cut. For example, Rubin's direct guessing/inductive inferencing and indirect production tricks could be classified as direct cognitive strategies and direct compensation strategies in Oxford, respectively (Rubin, 1981; Oxford, 1990).

Adapted from Hsiao and Oxford (2002)

TABLE 2
A Comparison of Two Major Strategy Classification Systems

O'Malley & Chamot (1990)	Oxford (1990)
O'Malley, Chamot, Stewner-Manzanares, Kûpper, & Russo (1985)	
O'Malley, Chamot, Stewner-Manzanares, Russo, & Kûpper (1985)	
Metacognitive Strategies	
Advance Organizers	Metacognitive Strategies
Directed Attention	Metacognitive Strategies
Selective Attention	Metacognitive Strategies
Self-Management	Metacognitive Strategies
Functional Planning	Metacognitive Strategies
Self-Monitoring	Metacognitive Strategies
Self-Evaluation	Metacognitive Strategies
Delayed Production	Metacognitive Strategies
Cognitive Strategies	
Repetition	Cognitive Strategies
Resourcing	Cognitive Strategies
Translation	Cognitive Strategies
Grouping	Memory Strategies
Note Taking	Cognitive Strategies
Deduction	Cognitive Strategies
Recombination	Cognitive Strategies
Imagery	Memory Strategies
Auditory Representation	Memory Strategies
Keyword	Memory Strategies
Contextualization	Memory Strategies
Elaboration	Memory Strategies
Transfer	Cognitive Strategies
Inferencing	Compensation Strategies
Socioaffective Strategies	
Cooperation	Social Strategies
Question for Clarification	Social Strategies
Self-Talk	Affective Strategies

Adapted from Hsiao and Oxford (2002)

O'Malley and Chamot (1990) classified three types or norms of language learning strategies. These strategies are Metacognitive, Cognitive and social/affective strategies. The Metacognitive means that the language learner thinks, plans, watches and then assesses his or her learning. The Cognitive strategies are the modification of text to make it more comprehensible for learners. The Social/affective strategies include using the social part of language and raising motivation to enhance the process of learning. The second classification is Oxford (1990) which was more conclusive and had more details. Her classification included: Cognitive, Mnemonic, Metacognitive, Compensatory, Affective and Social strategies. Cognitive strategy means making connection between previous knowledge and new ones. Mnemonic strategy resembles cognitive

however Mnemonic strategy uses certain formulas or phrases. Oxford's metacognitive strategies resembles O'Malley and Chamot's (1990) metacognitive strategy. Compensatory strategy uses context to overcome hindrance factors in language learning in the skills of reading and writing. Affective strategies indicate controlling emotions to be motivate learning. Finally, social strategy is conversing with L2 native speakers and immersing in their cultures in order to learn language.

Strategies Elicitation Methods

Many elicitation methods were used to explore learners' strategies use with an acceptable level of validity and reliability. The elicitation methods were questionnaires such as Vandergrift (2006) for listening skills or Strategy inventory of Oxford, (1990) or verbal reports, in the studies of Anderson (1991), Anderson & Vandergrift (1996), Cohen & Hosenfeld (1981), Oxford & Burry-Stock (1995), Phakiti (2003), and Sari (1987). Strategies were examined in other fields related to cognition and neuroscience by many researchers such as Bialystok (1981), Bowles & Leow (2005), Ericsson & Simon (1987), Leow & Morgan-Short (2004), Nayak, Hansen, Krueger, & McLaughlin (1990), and Schraw & Moshman (1995) and many others.

Based on previous paragraphs, strategies are very important factors that may help second language learners through their pursuit of learning L2. This may lead SLLs to learn second language independently without relying on their teachers. However, there is disagreement between theories in this area about the classification of these strategies, which makes it difficult for language teachers as well as researchers in presenting these strategies. The goal of this study is to explore the issue of strategies classification to see whether these strategies contribute to the proposed classification through confirmatory factor analysis. This is going to explore how each item is loading to the latent construct "different classification of strategies." This may help teachers

and researchers of second language learning strategies facilitate language learning for learners. Moreover, this study is going to the first study that explore and classify Saudi students' second language learning strategies. There is no previous study in that context.

Chapter III: Methods

Participants

English is a foreign language in Saudi Arabia that used to be taught in middle and high schools only. However, just recently it has been introduced in elementary school. The method used is the more traditional "grammar translation method." The targeted sample for this study will be Saudi second language learners of English. This study will have a purposeful sample because no previous scholars have applied SILL within this context. Regarding their language level all these learners should be students in USA universities or at least, they score 6 in IELTS or above 80 in TOEFL to consider them exemplary students, because it is expected that successful students are good users of language learning strategies. The age range is going to be wide ranging from approximately 20s to late 50s.

Procedure

The participants in this study will utilize the 7.0 version of the Strategy Inventory of Language Learning (SILL). This current study will only use the strategy of second language learning section rather than the motivation section. Participants will be assured that there are no right or wrong answers and that their choices simply indicate their style of learning only. Each student will remain anonymous and, more importantly, his or her data will be codified and protected to ensure confidentiality. An online survey provider will be used and the approximated time for participation will be 15 - 20 minutes.

Instrument

The SILL consists of 50 items that have clear latent variables or factors. This scale has six factors, each of which represents one of the following strategy types: (a) memory strategies are assessed by items 1-9; (b) cognitive strategies are represented by items 10-23; (c) compensation

strategies are represented by items 24-29; (d) metacognitive strategies are denoted by items 30-38; (e) affective strategies are represented by items 39-44 and (f) social strategies are denoted by items 45-50. These factors are correlated, (Hsiao and Oxford, 2002), which will make it easier for the researcher to test their validity. The original scale, which is not going be used in this study, had answers ranging from 1-5. This study will be using the 8-point bipolar scale, which ranges from "never use it," which is denoted by number 1 to "often use it," which is represented by number 8. However, this paper may use a scale from 1 to 100 with "never use it" and "often use it," on opposite ends for which the participants will use a cursor to specify a range. The numbers between have no descriptors. This range may allow students to express their use of certain strategies more accurately.

The reliability measurement performed using Cronbach's alpha (1951) was .94 for the entire scale. According to Hsiao and Oxford (2002), the alpha level for each factor is 75, .84, .69, .86, .68 and .78 respectively for each subset of the scale. They later tested the validity of this scale by carrying out a series of chi-square difference tests developed by Anderson and Gerbing (1998). They found that this scale, which measures six types of second language learning strategies, has discriminant validity and evidence of criterion validity because use of second language learning strategies is always associated with language proficiency. Green and Oxford (1995) found that 78% of the variance of the subtests' scores could be explained by SILL. In other studies, Dreyer and Oxford (1996), Ehrman and Oxford (1995), Ku (1995), and Mullins (1992) suggest that different levels of explained variances ranging from .30s-.68 could be accounted for by SILL. Validity of this measurement scale is supported by the relationship between SILL and certain constructs such as learning styles, personality factors and beliefs. Moreover, according to Yang (1992) and Ku SILL tends to yield accurate and honest answers from the survey takers.

Rival Models

To test this scale, the current study must produce several models to determine if there are latent variables or not. To achieve this, the current study will follow the methods of Hsiao and Oxford (2002) by producing eight models to test our hypotheses. Model number zero will be the null model in which it is proposed that none of the fifty items of our scale will be correlated with other items. As suggested by Bentler and Bonett (1980), this model will serve as the baseline to which other models will be compared. The second model, model1, will be the general strategy factor model. In this model, it is suggested that there is a correlation between the scale items. The third model, model.2, will be based on Oxford's (1990) direct/indirect dichotomy of second language learning strategies. This model hypothesizes that direct strategies assessed by items 1 through 29 are correlated and items 30 through 50 are correlated as indirect strategies. The fourth model is model.3, which is going to be a three-factor oblique model. Cognitive strategies are represented by items 1 through 29 for factor 1, and metacognitive strategies is represented by items 30 to 38 as the second factor, and the rest are socioaffective strategies as the third factor. The fifth model is model.4. In this model, there are four factors and it is the same as model.3 with one exception in which socioaffective factor divided into two- the affective factors and the social factors, which will be represented by items 39-44 and 45- 50 respectively.

The following element is a five-factors oblique model, model.5, which is an extension of model.3 but with two additions to model.4., in which the first factor "cognitive strategies" is divided into three factors represented by items 1-9 for memory strategies, 10-23 for cognitive strategies and 24-29 for compensation strategies. Model.6 is a six-factor oblique model for which items 1-9 represent memory strategies, items 10-23 denote cognitive strategies, items 24-29

represent compensation strategies, items 30-38 represent metacognitive strategies, items 39-44 denote affective and items 45-50 represent social strategies. Model 7 will be similar to model.6, however, it will encompass one higher order factor that will combine all six factors into one higher order factor. Model.8 will be similar to model 6, but it will include two higher order factors that will be represented by direct and indirect strategies. The first will include memory, cognitive and compensation strategies, the second higher-order factor will include metacognitive, affective and social strategies as first-order factors. In addition, six more orthogonal models will be produced to ensure that factors 2U (U abbreviation for uncorrelated), 3U, 4U, 5U, 6U, 7U and 8U in the previous models will not be correlated.

Hypotheses

RQ.1. Do Saudi university students use learning strategies that are consistent with SILL? Do all items go in one direction?

We will determine if the use of Saudi students' strategies can be measured in one dimension, meaning that all scale items correlate with each other, or if they represent many dimensions. For example, do direct strategy items correlate more with each other than with indirect strategy items on this scale?

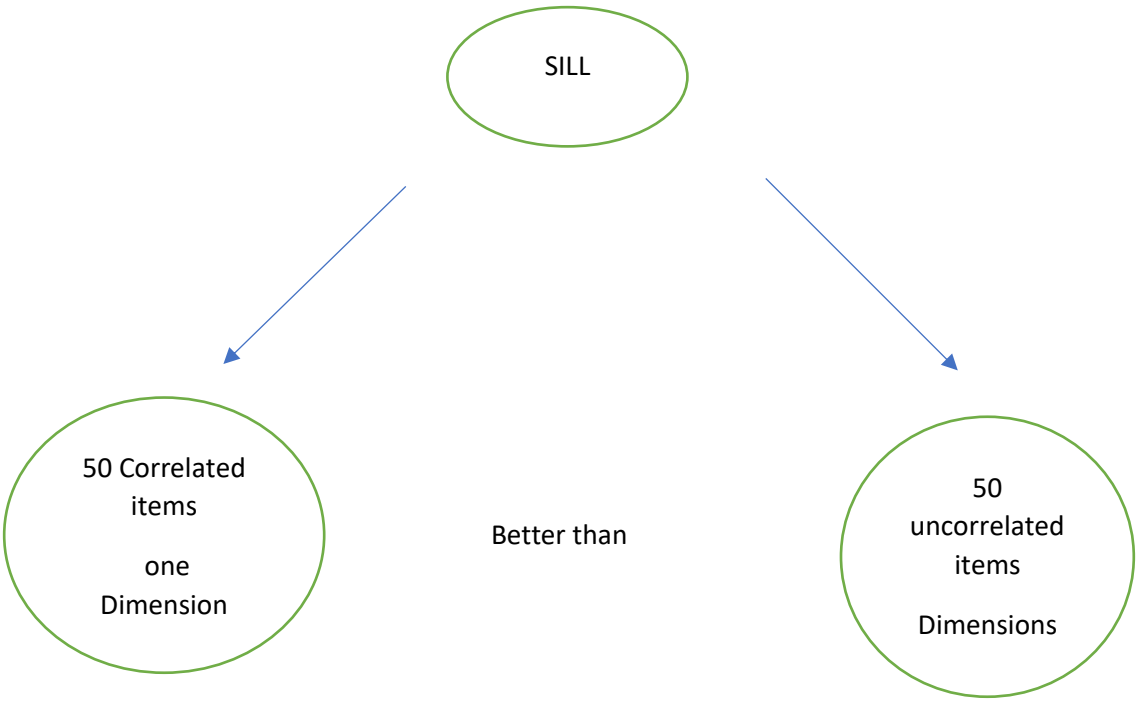


Figure.4 SILL's Directionality

RQ. 2. Do Saudi university students use SILL learning strategies according to the sub-classifications of SILL?

We will determine if the use of Saudi students' strategies correlates with factors measured by this scale, including direct, indirect, cognitive, metacognitive, compensatory, affective and social strategy subsets. This is an attempt to explore if Saudi students' use of strategies, represented by items of subsets, correlate more with each of these subsets than with items from the other subsets. For example, the items that represent cognitive strategies should correlate with each

other and the metacognitive items should also be consistent with each other. However, these subsets' items should not correlate with each other between groups. In other words, each subsets' items pull in the same direction but in a different direction with regard to the other subsets.

To answer our second research question, there are seven hypotheses to be tested in this study.

> ***Hypothesis 1***, All correlated subsets of items will be used to explain the higher level of variance of student answers on this scale rather than on the null model, for which it is expected that there will be no correlation or relationship between any of the fifty items. This is because in the null model, items do not measure the same construct.

This hypothesis tests whether or not the eight proposed models of correlated subsets of items will differ from the baseline model "model Zero" for which it is expected that all 50 items will not be correlated. In other words, there should be no relationship between these 50 items. This is the first step in answering the first research question: 'Do Saudi university students use learning strategies that are consistent with SILL?' If there is a difference between model zero and the other models, then this study could postulate that Saudi students demonstrate some latent traits concerning their strategy use.

Hypothesis 2, All correlated models of subsets of items are significantly more effective than the uncorrelated models. For example, correlated items of the direct and indirect strategy subsets more accurately explain the performance of students than do the uncorrelated subsets of direct and indirect strategy items.

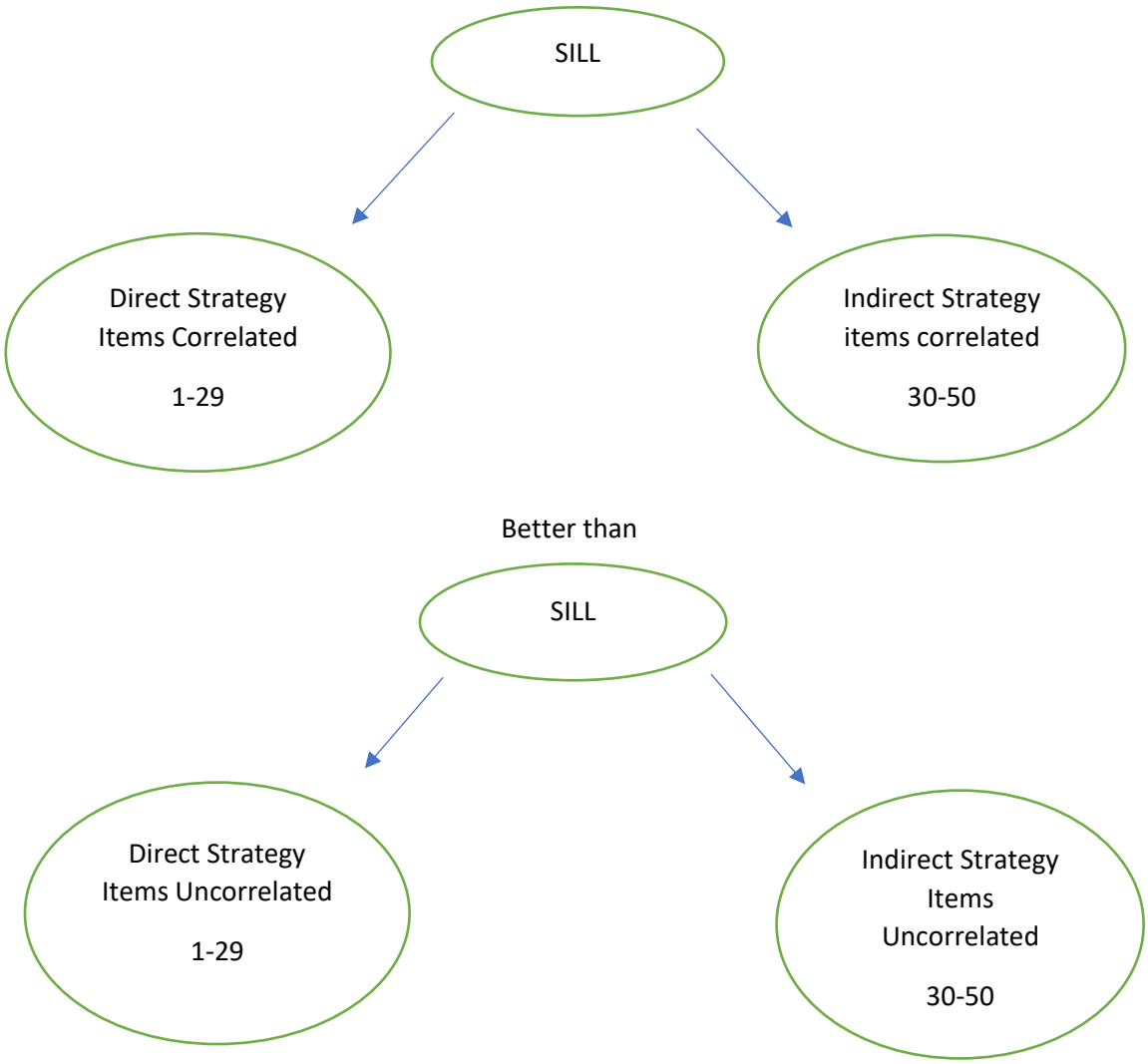


Figure. 5 correlated and uncorrelated subsets of direct and indirect strategies

This hypothesis suggests that correlated models are significantly more effective than their uncorrelated counterparts for explaining student performance. This outcome could strengthen the results regarding the first hypothesis.

Hypothesis 3, Correlated subsets of the cognitive, metacognitive and socio-affective strategy items will explain the higher level of variance in strategy use more accurately than the correlated subsets of the direct and indirect items.

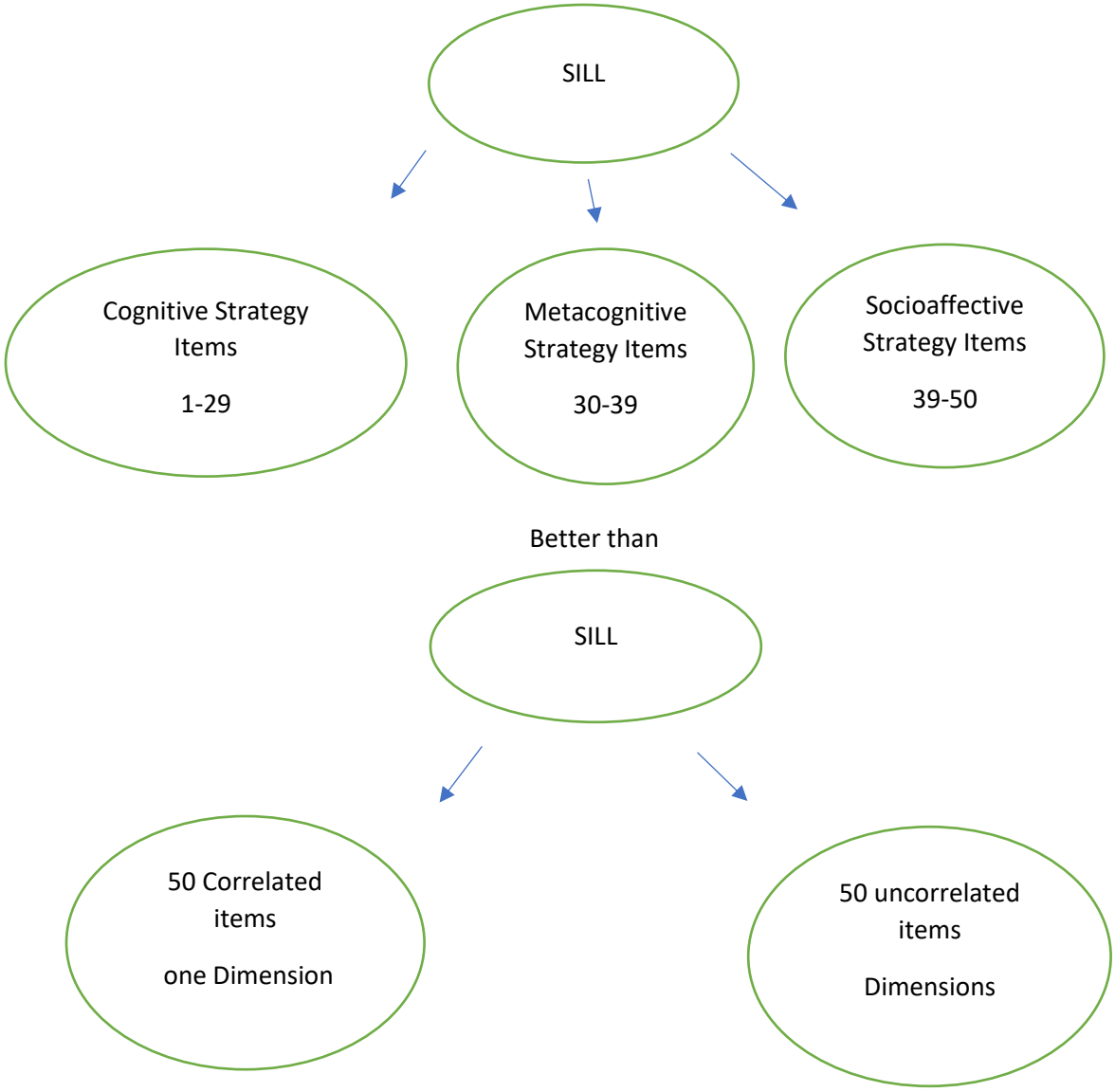


Figure.6 Three factors model in comparison to two factors model

The third hypothesis could reveal more information about Saudi students' correlated subsets or factors. At this stage, it is expected that Saudi students would demonstrate more variance through the three factors of cognitive strategies, metacognitive, and socio-affective strategies in comparison to the two-factor model which is used to assess direct and indirect strategies of SILL. This data would help us expand on the answers obtained regarding the first two hypotheses and research questions.

Hypothesis 4, The correlated items of cognitive, metacognitive, affective and social strategy subsets will explain the higher variance level of strategy use more effectively than the correlated subsets of cognitive, metacognitive and socio-affective strategies for Saudi students' performance.

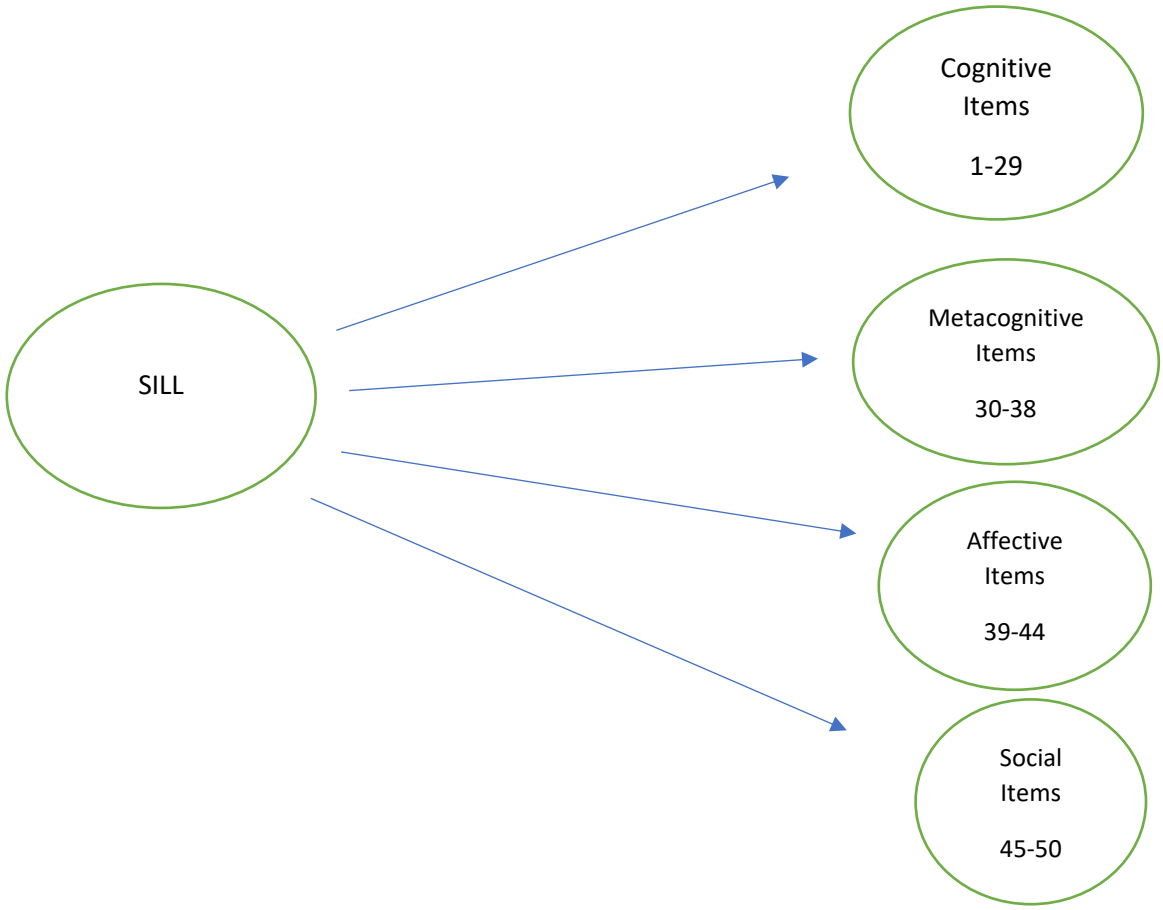
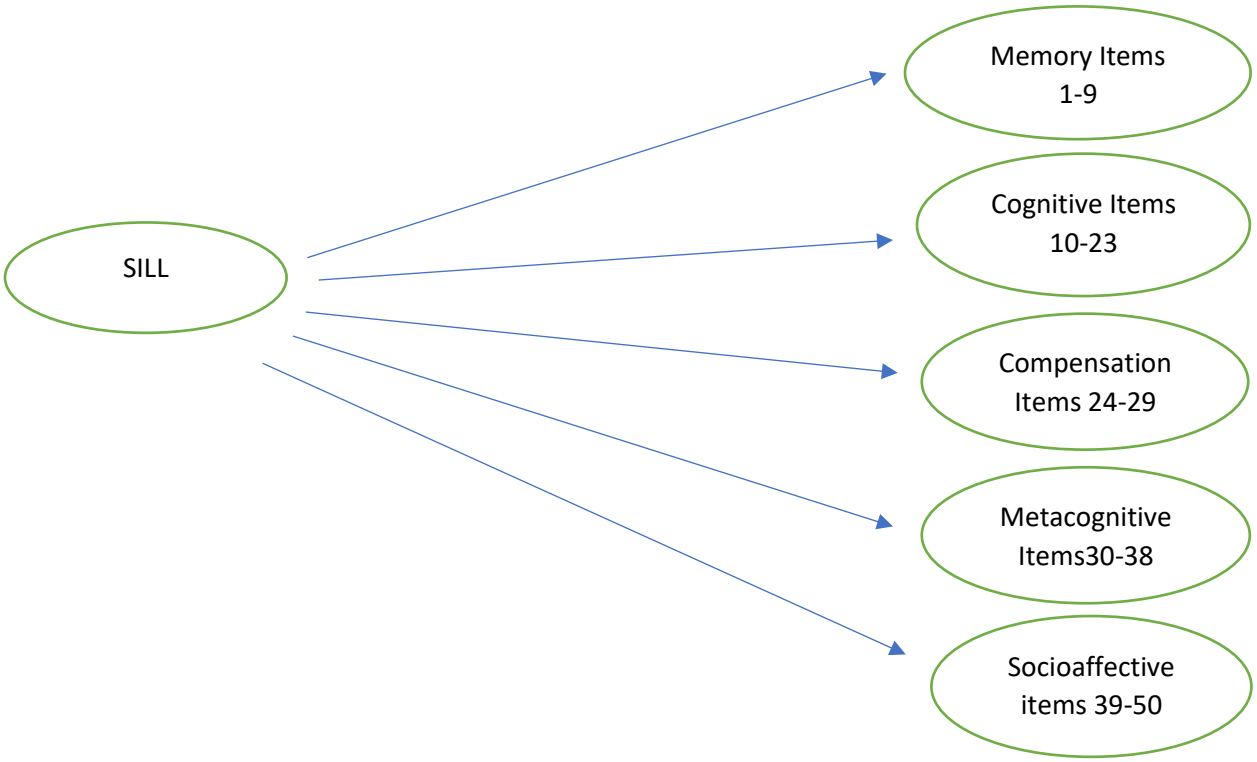


Figure.7 Three factors model in comparison to two factors model

The data on the fourth hypothesis will give us more information to answer our research questions. Model 4 will provide us more details regarding if Saudi students exhibit more latent traits or factors compared to model.3. In this stage, this paper will determine if Saudi students are guided by cognitive, metacognitive, affective and social factors rather than simply cognitive, metacognitive and socio-affective factors only. With this outcome, it would be apparent that Saudi students exhibit more correlated subsets or factors and conform to Oxford's SILL more than hypothesis three suggests.

Hypothesis 5, Correlated items of memory, cognitive, compensation strategies, metacognitive, socio-affective strategy subsets will explain more variance of strategy use than the correlated subsets of cognitive, metacognitive and affective and social strategies for Saudi students' performance.



Better than

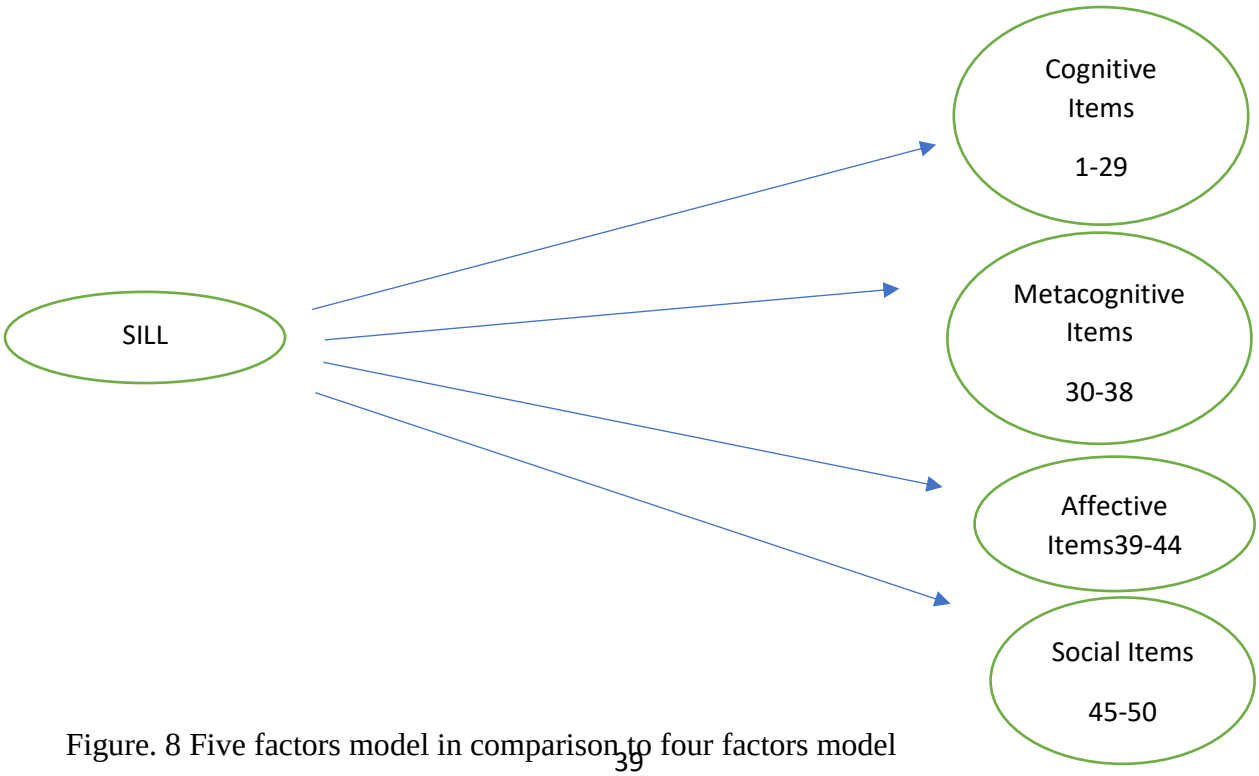


Figure. 8 Five factors model in comparison to four factors model

This hypothesis proposes that model 5 is more effective than model 3 because the former adds to model 4 by dividing the first factor into three factors. Cognitive strategies of model 4 are divided into memory, cognitive and compensation strategies. This could reveal for us more correlated subsets within Saudi students' use of strategies. This data would help the researcher to answer the first and the second research questions in addition to the previously obtained information.

Hypothesis 6, Correlated items of memory, cognitive, compensation, metacognitive, affective and social strategy subsets will explain the higher variance of strategy use than any of the previously correlated subsets in the abovementioned hypotheses.

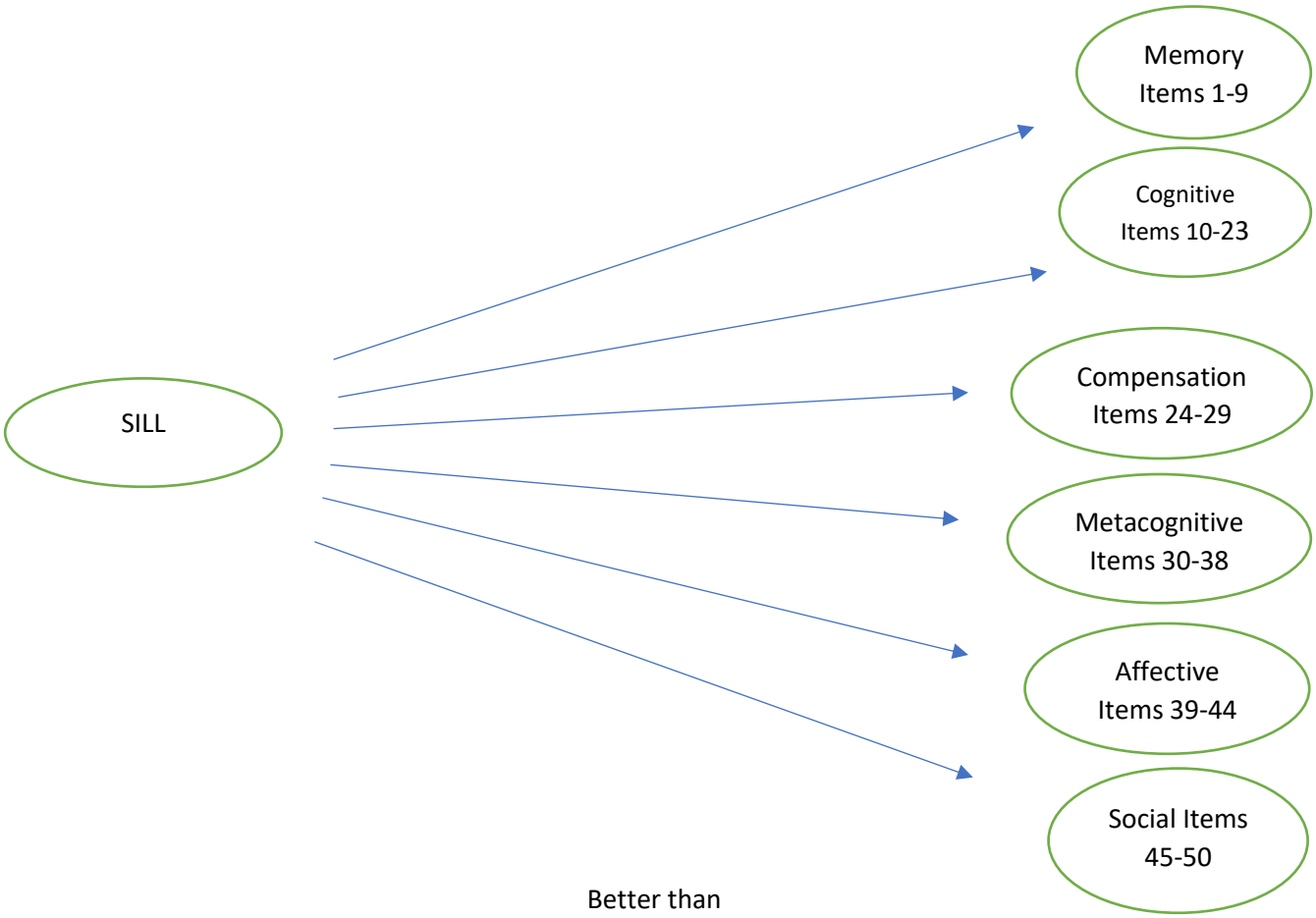
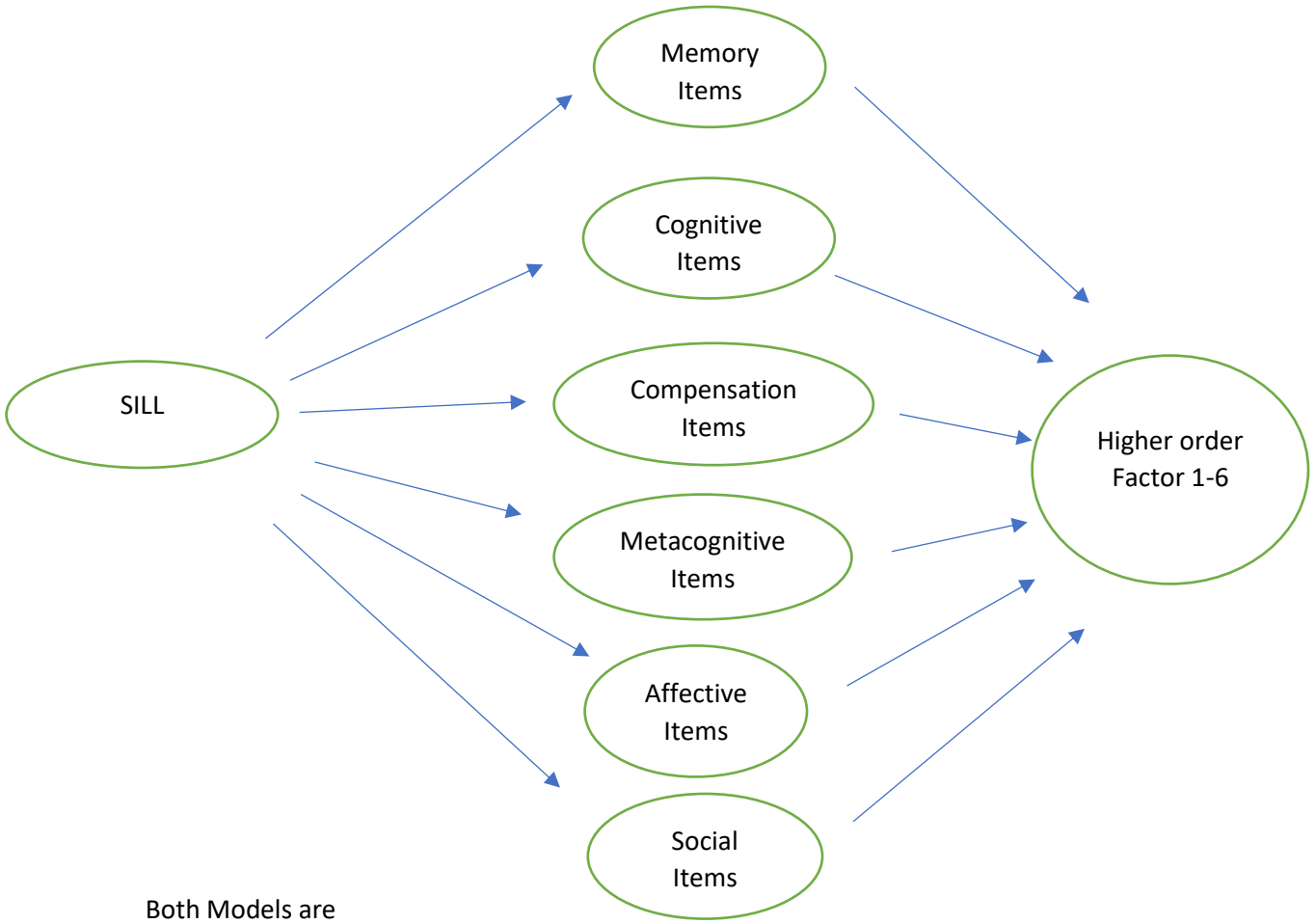


Figure.9 Six Factors model in comparison to five factors model

This hypothesis states that the correlated subsets will more accurately explain Saudi students' variance than any of the previously correlated subsets including memory, cognitive, compensation, metacognitive, affective and social strategy subsets or factors. This will give us more information about Saudi students' latent traits which will be assessed by the correlated subsets and their conformity to the Oxford's SILL.

Hypothesis 7, The correlated subsets of memory, cognitive, compensation, metacognitive, affective and social strategies along with the correlation between these six subsets will explain the higher variance of strategy use more effectively than hypothesis 6. Moreover, the correlated subsets of memory, cognitive, compensation, metacognitive, affective and social strategies along with the correlation between direct and indirect strategies will explain the higher variance level in strategy use more effectively than hypothesis 6.



Both Models are Better than all Previous Models

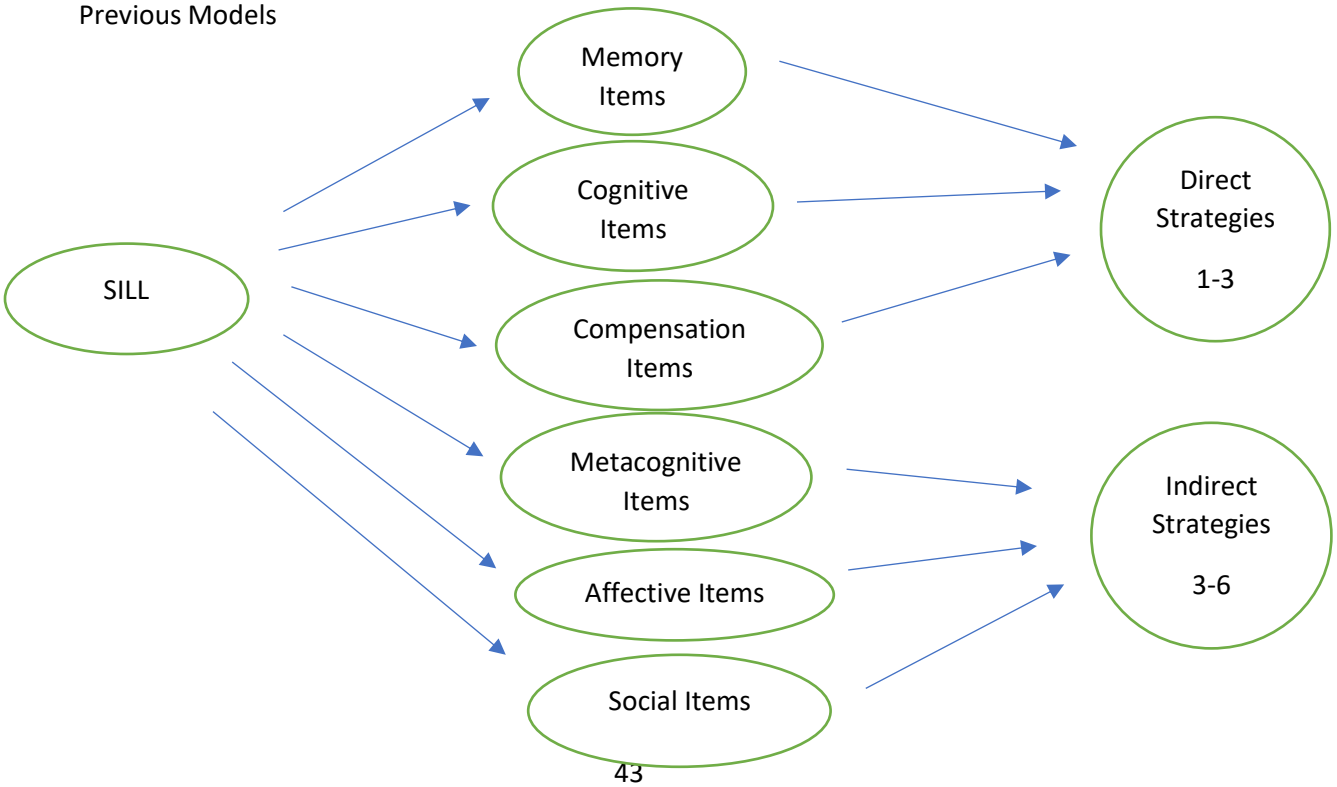


Figure.10 Seven factors model and eight factors model

This hypothesis will help us investigate higher order factors. It may demonstrate that model.7 represented by model 6 with the addition of a higher order factors that encompass all six factors into one in model 6 under one higher order factor. Moreover, it includes model 8 represented by model 6's factors and another two higher order factors of direct and indirect strategies. These two models will provide us with the most complete answers to our research questions in addition to the findings of the previous hypotheses.

These hypotheses indicate that our research questions cannot be answered by the first two hypotheses alone, rather, by the culmination of the results for all the hypotheses. And if Saudi students do not demonstrate latent traits that do conform to Oxford's SILL, this will open the door for making future improvements to this scale or possibly creating a new scale that may help us to more accurately assess our students' use of strategies.

3. Do Saudi university students use learning strategies which are not included in SILL?

With this question, the current study will investigate two points. First, if our participants only mention strategies that are included in SILL, then this study could conclude that there is a problem with the scale that makes it incomprehensible to our participants. Second, if students mention any new strategies that are not included in this scale, then it is apparent this scale needs improvement. This opens the door for future research to improve this scale to make it more inclusive regarding second language learning strategies. Both points could help language teachers to present more useful strategies to their students that will help them to succeed.

Analysis

We will assess the reliability and dimensionality of these items using exploratory factor analysis first. Then, confirmatory factor analysis is going to be used with these estimators: robust maximum likelihood estimation (ML and MLR) in the *lavaan* package (Rosseel 2012) in R, R Core Team (2017). The software program used for the analysis of this measurement tool is the RStudio version 0.99.903, which is an integrated development environment (IDE) of R. To assess the fitness of every model, this study will use global fit indices, Chi square, Root Mean Square Error of Approximation "RMSEA", Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). Furthermore, modification indices and normalized residuals will be used to analyze any potential localized areas of strain. Then, there will be an inspection of parameter effect sizes and significance. Lastly, all item information and model-based reliability will be analyzed to evaluate my models.

Chapter IV. Results

This chapter presents the findings of the exploration into Saudi students' second language learning strategies with the help of (Oxford's, 1990) strategies inventory of language learning. The purpose of this study was to answer the following research questions:

RQ.1. Do Saudi university students use learning strategies that are consistent with SILL? Do all items go in one dimension?

RQ. 2. Do Saudi university students use SILL learning strategies according to the sub-classifications of SILL?

RQ. 3. Do Saudi university students use learning strategies which are not included in SILL?

Demographics of the Sample

We recruited 465 Saudi learners of English as a second language to participate in our study. Each satisfied the criteria that were set by the researcher of maintaining an exemplary level of English language comprehension, as confirmed by a score of six on the IELTS, above 80 on the TOEFL and either working or studying at a US institution. Two hundred and eleven of the participants were female (45.37%) and 254 were male (54.62%). All resided in the US at the time of the study.

Data Cleaning

Due to the fact that the body of data was large and difficult to analyze, the researcher required the help of R, specifically `na.omit` was used to clean the data by deleting all the cases and rows of missing information. Before this process, there were approximately 521 cases with missing or incomplete answers. After cleaning, the final number of complete cases was 465. The study lost 56 due to omissions. The scale was sent to over six thousand possible participants and 521

responses, or approximately 8.6% of the surveys were returned, which is low and that can be attributed to the length of the instrument.

Results

To answer the research questions, we established eight rival models. The following table shows the factors each of which contains a number of items that load the factor.

Model	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1	SILL (50 Item)	-	-	-	-	-	-	-
2	Direct (1-29)	Indirect (30-50)	-	-	-	-	-	-
3	Cognitive (1-29)	Metacognitive (30-38)	Socioaffective (39-50)	-	-	-	-	-
4	Cognitive (1-29)	Metacognitive (30-38)	Social (39-44)	Affective (45-50)	-	-	-	-
5	Memory (1-9)	Cognitive (10-23)	Compensation (24-29)	metacognitive (30-38)	Socio-affective (39-50)	-	-	-
6	Memory (1-9)	Cognitive (10-23)	Compensation (24-29)	Metacognitive (30-38)	Social (39-44)	Affective (45-50`)	-	-
7	Memory (1-9)	Cognitive (10-23)	Compensation (24-29)	Metacognitive (30-38)	Social (39-44)	Affective (45-50`)	High order factor (1-6 factors	-
8	Memory (1-9)	Cognitive (10-23)	Compensation (24-29)	Metacognitive (30-38)	Social (39-44)	Affective (45-50`)	High order factor. (Direct Strategies)	High order factor (Indirect Strategies)

Table. 3. Rival Models.

RQ.1. Do Saudi university students use learning strategies consistent with SILL? Do all items contribute to one dimension?

The results did not support either component of this question. To answer the first part, we constructed an operational test regarding model 1, in which all items load to one factor. The results of this test which compared correlated to non-correlated items are provided in the appendices under Appendix.7.

To determine the fitness of the model, we tested its CFI, TLI, RMSEA and SRMR. There are accepted values for these fit indices. When these numbers fall below a certain threshold, the model is deemed unfit and is not capable of accurately measuring items. In other words, we must determine if items contribute to one construct as this model suggests. According to our results, this model was not fit. The Standardized Root Mean Square Residual (SRMR) should be 0.8 or less, and in this model, it was .045. The other fit index, the Root Mean Square Error of Approximation (RMSEA) was 0.021, which is good. The last two fit indices, the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) were .000 and -.388 respectively, both of which were not acceptable because they should have been above .95 for the model to be considered fit. According to the results of structural equation modeling, provided in Appendix 8, which shows the path analysis between items and its factor, Saudi students use of strategies is not consistent with SILL therefore, we must establish other models based on Oxford's classification to see if these models will be more reliable.

RQ. 2. Do Saudi university students use SILL learning strategies according to the sub-classifications of SILL?

To answer this question, we proposed and built seven models. Model 2, the results of which are provided in Appendix 9, was designed to compare the uncorrelated items of two major dimensions (direct and indirect strategies factors).

According to our results, this model was unfit. The SRMR was .045 and the RMSEA was 0.018, which are good. However, the last two fit indices, the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) were .020 and -.023, which were both unacceptable. The structural equation modeling, provided in Appendix 10, shows the path analysis between items and its two factors. According to these results, Saudi students use of strategies is not consistent with SILL. Therefore, we need to test other models that may be more reliable. Based on model 2, the group of items between 1 and 29 did not load to the construct of direct strategies or dimension. In addition, the group of items between 30 and 50 also did not load to the construct of indirect strategies or dimension.

Model 3 output is provided in Appendix 11. The highlighted result shows that this model was also not fit. The SRMR was .045 and the RMSEA was 0.018, which were good. However, the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) scores were .000 and -.100 respectively, both of which were unacceptable for being far below the recommended threshold of .95. The structural equation modeling shows the path analysis between items and its three factors, which is shown in Appendix 12. Based on these results, Saudi students use of strategies is not consistent with the SILL three factors model. Their performance did not load to the three suggested

constructs of cognitive (items 1-29), metacognitive (items 30-38) and socio-affective (items 39-50) strategies or dimensions. Therefore, there is a need to test other models that may be more fit.

Due to the fact that model 4 did not converge means that it was not reliable. The structural equation modeling, shown in Appendix 13, indicates the path analysis between items and its four factors. Based on these results, Saudi students use of strategies is not consistent with the SILL four factors model. For example, we found that they do not utilize second language learning strategies according to the constructs of cognitive (items 1-29), metacognitive (item 30-38), social (items 39-44) and affective (items 45-50) proposed by Oxford. Consequently, their use did not load to these dimensions. Therefore, there is a need to test other models that may yield more reliable results.

Similar to Model.4, model 5 did not converge and was thus shown to be unreliable. Its output is provided in Appendix.14. The structural equation modeling, provided in the Appendix 15, shows the path analysis between items and its five factors. Based on these results, Saudi students use of strategies is not consistent with the SILL five factors model. In other words, they do not use the second language learning strategies according to the constructs of memory (items 1-9), cognitive (items10-23) compensation (item 24-29), metacognitive (items 30-38) and socio-affective (items 39-50) proposed by Oxford. Accordingly, their use did not load to these dimensions. Therefore, there is a need to test other models that may yield more reliable results.

The highlighted results show that this model was not fit. The SRMR was .044 and the RMSEA was 0.012, which was good. However, the scores for the last two fit indices, Comparative

Fit Index (CFI) and the Tucker-Lewis Index (TLI) were .525 and .499 respectively, which are not at the recommended threshold. However, these scores were the most fit compared to the previous models. Its output is provided in Appendix.16. The structural equation modeling for model 6 shows the path analysis between items and its six factors. This is provided in the Appendix .17. Based on these results, Saudi students use of strategies is not consistent with the SILL's six factor model. Therefore, they do not use second language learning strategies according to the constructs of memory (items 1-9), cognitive (items10-23) compensation (item 24-29), metacognitive (items 30-38), social (items 39-44) and affective elements (items 45-50) proposed by Oxford. Hence, their use did not load to these dimensions. Therefore, we must test other models that may yield more reliable results.

The highlighted results show that this model was unfit. The SRMR was .045 and the RMSEA was 0.016, which is considered good. The scores of the last two fit indices, Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), were .217 and .180, which were unacceptable. This is provided in Appendix 20. However, these scores were the most fit compared to the first five models. Model.6 had a better fit than this model. The structural equation modeling, which is provided in Appendix 21, shows the path analysis between items and their seven factors. Based on these results, Saudi students use of strategies is not consistent with the SILL seven factor model. In other words, Saudi Students do not use second language learning strategies according to the constructs of memory (items 1-9), cognitive (items10-23) compensation (item 24-29), metacognitive (items 30-38), socio-affective elements (items 39-50) and the high order factor (1-6 factors) proposed by Oxford. As a result, their use did not load to these dimensions. Therefore, we must test other models that may yield more reliable results.

Due to the fact that model 8 did not converge, as shown in Appendix 22, it was considered to be unreliable. The structural equation modeling, in Appendix 23, shows the path analysis between items and its eight factors. Based on these results, Saudi students use of strategies was not consistent with the SILL eight factor model. For example, they do not use second language learning strategies according to the constructs of memory (items 1-9), cognitive (items10-23) compensation (item 24-29), metacognitive (items 30-38), socio-affective (items 39-50) elements and the two high order factors of direct and indirect strategies factors between the previous six factors) proposed by Oxford. As a result, their use did not load to these proposed eight dimensions.

Factor	Mean
Memory Strategies	2.983
Cognitive Strategies	3.511
Compensation Strategies	3.340
Metacognitive Strategies	3.547
Social Strategies	2.8155
Affective Strategies	3.523

Table. 4 Saudi Students' use of second language learning strategies

Based on Model six, Saudi students use strategies differently. Table four shows that their highest use is within the domain of metacognitive strategies, where they think and plan their learning. This is a good attribute of language learners. The other two types of strategies that Saudi students use extensively are affective and cognitive strategies. The fourth type of strategies that they use is compensation strategies.

On the contrary, they use memory strategies less than the previous strategies. The least type of strategies that Saudi students use, is social strategies. We should be cautious with these results because, social and affective strategies are always related and based on that, we would

expect similar performance for Saudi students on these strategies, however it is the opposite. The same issue can be seen with memory and cognitive strategies.

Because model 6 showed the best reliability out of the eight models, we tested it further using the Omega Test of Reliability.

$$\text{“Omega” Test Reliability} = (\Sigma\lambda)^2 / [(\Sigma\lambda)^2 + \Sigma\,\mathbf{Var(e)} + 2\Sigma(\mathbf{e\ cov})]$$

- The squared sum of the ***unstandardized*** factor loadings, over that + the summed error variances + 2*summed error covariances

Omega is calculated per factor because it assumes unidimensionality. This equation reveals the reliability for the sum of the items assuming that the factor model is the underlying process that fits the data. After running this test on model 6, the Omega graph and table, shown in Appendix 18, show that all items load to its specific factor except three that cause cross loading between factors. These items are also highlighted in the Appendix 19, as items 14, 15 and 28. The first cross loadings occurred between the second factor and the fourth. The second cross loading took place between the first factor and the fifth. These cross-loadings will cause non-fitness in any model, including model.6.

RQ. 3. Do Saudi university students use learning strategies that are not included in SILL?

This was the last survey question and only 69 participants answered it. Interestingly, forty-five respondents answered with a “no.” That outcome left twenty-four participants with some suggestions that can be classified as new strategies, which Oxford did not include, or they might overlap with some of the strategies, but use different wording.

The participants answers were quite similar to the information Oxford presented in her inventory. There were very few strategies suggested by participants some of which were similar to what Oxford presented. For example, watching or listening to English programs was used by many participants in different forms, such as YouTube, movies, podcasts and many other types of media. They also mentioned learning words through remembering the syllables and conversing with native speakers. Additionally, they shed light on the importance of using the second language extensively to master it. Moreover, the participants discussed creating a link between newly learned words and known concepts.

On the other hand, some participants presented strategies that were different from those suggested by Oxford. They reported using the dictionary as a tool for learning a second language, which is an important factor that was not included in Oxford's inventory. Also, for a writing assignment, they would brainstorm in their native language and rewrite their ideas in the second language. This is not the best strategy; however, it is popular. Some participants talked about reading the newspaper to help them use English and to learn new words. The best two strategies were using subtitles or video captions to learn English and make connections between listening and reading. The last strategy was used by a tutor working at a university in the US. He stated that he could not use English as effectively until he was offered this job. He realized the situation is different from just practicing English. He has mastered the content area, even though he is not a native speaker. This created a chance for him to use English in his field of study.

Evidently, the problem was that there was significant overlap between the strategies presented in the Oxford method and the additional strategies suggested by the study's participants. The main point is that the Oxford classification is overlapping. If we look at Table 3, Rival Models, we can see that some items are representative of different constructs. For example, item.1 could be part of

the following constructs SILL, direct, cognitive and memory strategies. Item 24 could be part of the SILL, direct, cognitive and compensation strategies constructs. Item 30 could be part of the following constructs SILL, indirect and metacognitive strategies. Item.39 could be part of the SILL, indirect, socio-affective and social strategies). Item 45 could be part of the following constructs (SILL, indirect, socio-affective and affective strategies).

However, the participants in this study suggested some strategies that were mentioned by Oxford and some that were not. This indicates that the current scale of second language strategies requires many refinements in order to accurately reflect the second language strategies actually used by students. According to (Raykov and Marcoulides , 2011) two of the most important features of any instrument validity are sensitivity and specificity, which ensure that the instrument is accurate and can effectively measure the degree of agreement between the instrument and the gold standard. The problem with this instrument is that it could not provide accurate classifications for the learning strategies of Saudi students. Therefore, the researcher who built the model must use factor analysis or item response theory to ensure that the instrument is measuring what is supposed to measure to ensure its validity. It is a simple question, but it is difficult to answer.

Chapter V. Conclusion

This chapter provides elaboration and a summary of the study, recommendations for future research, and pedagogical implications for teachers. It also includes analysis of some of the limitations of this study. We attempted to address the two dimensions of the research questions discussed below, the first of which was to validate (Oxford's 1990) SILL scale and to classify the Saudi students' use of second language strategies using a number of models. The following are the three research questions presented in this study:

RQ.1. Do Saudi university students use learning strategies that are consistent with SILL? Do all items contribute to one dimension?

RQ. 2. Do Saudi university students use SILL learning strategies according to the sub-classifications of SILL?

RQ. 3. Do these students use learning strategies that are not included in SILL?

Regarding the first question, we found that Saudi students do not necessarily follow Oxford's suggestions stated in her fifty-item scale, which hypothesizes that the items on this scale measure one construct. The purpose of the first model was to test whether or not all items work in one dimension, meaning that all scale items are correlated. The results indicate that this model was not a good fit and was not reliable. For this reason, we searched for other models that might provide a more accurate picture of how Saudi students actually use second language learning strategies such as by targeting some sub-units or sub-parts of this inventory.

Based on the weaknesses of the previous model, there was a need to test other hypotheses that may reveal if Saudi students are more likely to make use of sub-units in this inventory rather than utilizing it as a whole. These should help answer the second research question. Therefore, we built seven more models to test which sub-units or units of strategies were most useful for students. Model 2 hypothesized that Saudi students may tend to use a direct-indirect dichotomy as a means of classifying their use of strategies. The results were similar to those of the first model. In short, we found that Saudi students do not use second language learning strategies in accordance with the dichotomy of direct – indirect strategy classification.

Model 3 hypothesized that students use cognitive, meta-cognitive and socio-affective second language learning strategies. The results for this model were not different from those of the

previous two models. This led to the fourth model, which hypothesized that Saudi students use cognitive, metacognitive, social and affective aspects of second language learning strategies. However, we found that their use of the following five aspects of language learning: memory, cognitive, compensation, social and affective also were not in accordance with these dimensions.

Of the last three models (6-8), model 7 proposed that students utilize the following seven dimensions of learning strategies: memory, cognitive, compensation, metacognitive, social, affective along with a higher order factor that encompassed all the previous six factors. While model 8 hypothesized that language learning strategies can be classified according to the dimensions of memory, cognitive, compensation, metacognitive, social, affective along with two higher order factors that encompass direct strategies into one higher order factor and indirect strategies into the other higher order factors. We found the results from the last two models to be unreliable measures of the dimensions proposed. However, model 6 correctly proposed that memory, cognitive, compensation, metacognitive, social, affective strategies are dimensions of second language learning strategies frequently utilized by Saudi students.

Although the fitness scores of models 6 were the most accurate of all the models, they were not excellent, according to (Brown, 2015). Therefore, we used the Omega Test to determine whether or not this model proposing what it claims or not. And to specify the items that lead to both outcomes. It showed a cross loading for items14, 15 and 28. Item 14 was loaded to factors two and four. While items 15 and 28 were loaded to factors one and five. This may be because these items were similarly worded. Item 14 “I start conversations in the second language.” was related to item 35, “I look for people I can talk to in the second language.” This may have led Saudi students to provide similar answers to both questions. Item.15, “I watch second language

TV shows spoken in the second language or go to movies spoken in the second language" was somewhat similar to item 50, "I try to learn about the culture of SL speakers." Item 28 may sound alike when compared to item.50 to our participants. The wording of item.28, "I try to guess what the other person will say next in the SL" was similar to item 30, "I try to find as many ways as I can to use my second language." Guessing is a strategy of learning a second language. Table 13, shown below, indicates why model six was the most accurate.

	# Items	# Parameters	Scaled Chi-Square	Chi-Square Scale Factor	DF	p-value	CFI	RMSEA	RMSEA Lower	RMSEA Upper	RMSEA p-value
One-Factor	50	150	1410.361	0.934	1175	0.000	0.000	0.021	0.016	0.025	1
Two-Factor	50	151	1347.248	0.975	1174	0.000	0.020	0.018	0.013	0.022	1
Three-Factor	50	153	1357.929	0.965	1172	0.000	0.000	0.018	0.013	0.023	1
Six-Factor	50	165	1242.610	1.013	1160	0.046	0.533	0.012	0.002	0.018	1
Seven-Factor	50	156	NA	NA	1169	NA	NA	0.000	0.000	NA	0

Table 5. Model Fit Statistics Using MLR

This table shows that model 6 was the most reliable due to having the lowest chi-square score at *p*.05. It also had the lowest RMSEA and the highest CFI compared to the other models, which shows that this model explained more results than any of the others. These findings correspond with those of (Hsiao and Oxford, 2002).

The third research question was formulated to determine whether or not Saudi students believe that SILL sufficiently covers all second language learning strategies. When many students mentioned strategies that are similar to those of this scale, we could conclude that there was a

problem with the wording of it. Moreover, students mentioned some strategies that were not part of this scale, although its creator claims that it adequately covers all second language learning approaches. However, according to our results, this scale will require significant revisions to represent all second language learning strategies. In addition, students were confused about the wording of the scale, particularly when three items were cross loaded with two factors and when they answered the third question, many discussed strategies that were similar to those of Oxford.

One popular strategy was to use subtitles or video captions to help them simultaneously strengthen their listening and reading skills in order to understand the spoken second language. This result was supported by Hsu et al, (2013), Markham et al (2001), Markham, & Peter, L. (2003) and Winke et al (2010). who found statistically better performance by learners who were exposed to video captions in many domains of language learning including, listening, reading along with vocabulary acquisition,

Now we will shift gears in the next several paragraphs to discuss recommendations for improving SILL and for establishing a new strategy skills measurement instrument that may help language teachers as well as learners. As previously noted, the wording of the scale is problematic, which according to (Xin and Chi, 2010) would lead us to question its construct validity and any results obtained from using that scale. It was obvious that the participants in this study had problems understanding this scale when they suggested some strategies that were previously mentioned in it. Thus, we should consult content experts to improve the wording.

According to (Cohen, Swerdlik & Phillips, 2009), the following steps should be taken to establish a scale:

1. Scale conceptualization

2. Scale construction

3. Scale tryout

4. Item analysis

5. Scale revision.

However, according to the literature, strategies of second language learning cannot be easily classified (Macaro, 2006). First, as discussed in the Literature Review section, there is no consensus among second language learning experts. Therefore, any scale will be biased because it is produced according to the preconceptions of its author, which is also true of SILL. Second, there are no specifications for second or third languages, which is a problem according to (Macaro, 2006). All these limitations were suggested by (Cohen, Swerdlik & Phillips, 2009). Much more research must be conducted to reach a consensus of strategies for language learning. We cannot proceed to the second element of scale construction until these fundamental criticisms are addressed. Due to a lack of consensus of strategies, future researchers must utilize sophisticated item analysis techniques to come up with a valid scale.

Due to the fact that strategies are so complex, it is wise to make them context specific. For example, instead of targeting general language learning strategies, it is more effective to focus on small components of language and analyze various types of strategies (Cohen, 2014). One of the pioneers in that area is (Vandergrift, 1999,2004,2006), who studies second language learning

metacognitive strategies and comprehension only within the domain of listening skills. This approach is supported by (Macaro, 2006) who argues that we could come up with hundreds of strategies if we target them in a general sense; however, this is not a realistic option. If we truly want to learn about them, we need a small sub-classification of strategies rather than one all-encompassing approach, which is not practical.

Our results confirmed Macaro, (2006) and Vandergrift, Goh, Mareschal & Tafaghodtari's (2006) view that language learning strategies, scales or classifications cannot be viewed holistically but rather in conjunction with acquisition of specific language skills. In other words, language researchers cannot have one construct that covers every strategy of language learning. However, they may work on a small construct to build a consensus of learning strategies. The results of this study indicate that none of the models were reliable except model 6, which showed only moderate reliability. In establishing this model, we applied Macaro and Vandergrift's method of dividing language strategies into six categories that include memory, cognitive, compensation, metacognitive, social and affective factors. The other models that incorporated many items did not show a good fit, even models 7 and 8, due to the fact that their higher-order factors were incorporated under one construct.

Limitations

The most important limitation of this study was the small sample size. According to Mundfrom, Dale & Tian (2009), Pearson & Mundform (2010) and Comrey & Lee (1992) sample size for factor analysis can range from 100 to more than one thousand participants. However, a sample from 100 to 500 is considered poor to good while one from 500 to 1,000 is very good, and above one thousand is excellent. Our study sample included only 465 participants which may be the reason we did not obtain strong results regarding the suggested models. Moreover, we selected

students from a wide range of disciplines, unlike previous studies such as those of (Hsiao and Oxford, 2002), that targeted participants from similar areas of study who could follow a prescribed way of learning, because they shared the same area of study.

Recommendations

In this section, some recommendations for teachers and researchers of second language acquisition will be presented.

1-The most effective strategies are widely disputed among second language experts. Therefore, researchers must come up with an agreed upon method for defining strategies. After that, they will be able to classify strategies according to constructs that represent these strategies. Classifying strategies according to constructs should have agreement between researchers and content experts on these construct or constructs (Kane, 2013).

2- The second problem was the wording of our scale. Model 6, our most effective one, showed cross loading between items and factors. Items. 14, 15 and 28 were cross-loading between two factors, which indicates that these items have similarities with other factors although they should not. Therefore, the wording of any scale should be clear for all students, so that teachers and researchers will be able to effectively analyze students' use of second language learning strategies.

3-Because students have different skills and backgrounds, testing of scale validity cannot be done with a group of students from the same school. They would have similar features that may become apparent in their use of the scale. Therefore, researchers must recruit second language learners from different areas of study, varying professions and from many cultures to analyze the scale. Students' language levels should be standardized, and both genders should be equally represented in order to have more generalizable outcomes.

4-We must narrow our testing or measuring procedures rather than analyzing the strategies all at once. Therefore, there is a need for definitional adequacy. After clarifying this aspect, we must focus on specific points with a specific number of strategies within specific language skills or domains. The best example to follow is (Vandergrift, 1999,2004,2006) studies, which focus on listening skills with specific types of strategies. This should be followed with other skills with specific types of strategies.

Summary

In the present study, we examined the strategies of Saudi students as second language learners of English via (Oxford's, 1990) SILL approach. The focus of this study was to determine if their use of second language strategies was consistent with SILL. In addition, we examined the validity of this instrument by having participants who were studying or working in the US utilizing SILL according to methods of learning English that were familiar to them.

We found that their use of strategies was not consistent with the SILL except in model 6. This model hypothesized that these students' use can be classified under memory, cognitive, compensation, metacognitive social, and affective strategies. This would seem to indicate that dividing strategies into small units that represent specific aspects of language learning will lead to improvement of second language learning strategy classification.

Conclusion

The most apparent problem with SILL is that it attempts to cover every aspect of language learning at once. There are many different components to languages that students are required to learn, such as grammar, vocabulary, cultural context and many more. Moreover, language learning differs greatly depending on the speaker's native language. This scale does not consider these

differences and sees learners as one size fits all. In addition, the skill level of the student is not considered in this scale which may cause some discrepancies that would be an intervening variable that would lower its validity.

The second main problem with this scale is its attempt to explore language without considering the skills that language learners bring to the classroom. This instrument tends not to acknowledge the four language skills: reading, writing, listening and speaking. There are specific strategies for mastering these skills and neglecting this reality will detrimentally affect the validity of this instrument.

To sum up, this instrument requires many refinements at various levels. As suggested by (Cohen, Swerdlik & Phillips, 2009) the content of this scale must be modified. This can be done by dividing strategies into smaller units that cover every aspect of language learning. Second, establishing the scales or sub-scales should be done in accordance with the first step of dividing the strategies into smaller units that cover every aspect of language learning. Third, the scale should be tested by language learners from different contexts to examine its effectiveness and suitability for use with students of various language backgrounds and cultures. Fourth, examining items using knowledge of the content and sophisticated statistical approaches such as factor analysis or item response theory will ensure the validity of these items and answer the simple question of validity Kane (2017) and Messick (1987).

Unfortunately, the majority of these previously mentioned steps were not used in building this scale. Therefore, we should be cautious as language teachers and researchers about using it and drawing conclusions based on its outcomes. However, we may use it as a starting point for

building newer and improved scales that cover second language learning strategies more comprehensively.

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Appendix .1

Strategy Inventory for Language Learning (SILL)

Version 7.0 (ESL/EFL)

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Directions

This form of the STRATEGY INVENTORY FOR LANGUAGE LEARNING (SILL) is for students of English as a second or foreign language. On the separate worksheet, write the response (l, 2, 3, 4 or 5) that tells HOW TRUE OF YOU THE STATEMENT IS.

l. Never or almost never true of me

2. Usually not true of me

3. Somewhat true of me

4. Usually true of me

5. Always or almost always true of me

NEVER OR ALMOST NEVER TRUE OF ME means that the statement is very rarely true of you.

USUALLY NOT TRUE OF ME means that the statement is true less than half the time.

SOMEWHAT TRUE OF ME means that the statement is true of you about half the time.

USUALLY TRUE OF ME means that the statement is true more than half the time.

ALWAYS OR ALMOST ALWAYS TRUE OF ME means that the statement is true of you almost always.

Answer in terms of *how well the statement describes YOU*. Do not answer how you think you *should* be, or what *other* people do. *There are no right or wrong answers to these*

statements. Put your answers on the separate Worksheet. Please make no marks on the items. Work as quickly as you can without being careless. This usually takes about 20-30 minutes to complete. If you have any questions, let the teacher know immediately.

EXAMPLE

I actively seek out opportunities to talk with native speakers in English.

On this page, put an "X" in the blank underneath the statement that best describes what you actually do in regard to English now. Do not make any marks on the Worksheet yet.

Always or

Never or Generally Not Somewhat Generally Almost Always

Almost Never True of Me True of Me True of Me True of me

1 2 3 4 5

_____ _____ _____ _____ _____

If you have answered the question above, you have just completed the example item. Now wait for the teacher to give you the signal to go on to the other items. When you answer the questions, work carefully but quickly. Mark the rest of your answers on the Worksheet, starting with item 1.

Strategy Inventory for Language Learning

Version 7.0 (ESL/EFL)

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l. Never or almost never true of me

2. Usually not true of me

3. Somewhat true of me

4. Usually true of me

5. Always or almost always true of me

(Write answers on Worksheet)

Part A

1. I think of relationships between what I already know and new things I learn in English.

2. I use new English words in a sentence so I can remember them.

3. I connect the sound of a new English word and an image or picture of the word to help remember the word.

4. I remember a new English word by making a mental picture of a situation in which the word might be used.

5. I use rhymes to remember new English words.

6. I use flashcards to remember new English words.

7. I physically act out new English words.

8. I review English lessons often.

9. I remember new English words or phrases by remembering their location on the page, on the board, or on a street sign.

Part B

10. I say or write new English words several times.

11. I try to talk like native English speakers.

12. I practice the sounds of English.

13. I use the English words I know in different ways.

l. Never or almost never true of me

2. Usually not true of me

3. Somewhat true of me

4. Usually true of me

5. Always or almost always true of me

(Write answers on Worksheet)

14. I start conversations in English.

15. I watch English language TV shows spoken in English or go to movies spoken in English.

16. I read for pleasure in English.

17. I write notes, messages, letters, or reports in English.

18. I first skim an English passage (read over the passage quickly) then go back and read carefully.

19. I look for words in my own language that are similar to new words in English.

20. I try to find patterns in English.

21. I find the meaning of an English word by dividing it into parts that I understand.

22. I try not to translate word-for-word.

23. I make summaries of information that I hear or read in English.

Part C

24. To understand unfamiliar English words, I make guesses.

25. When I can' t think of a word during a conversation in English, I use gestures.

26. I make up new words if I do not know the right ones in English.

27. I read English without looking up every new word.

28. I try to guess what the other person will say next in English.

29. If I can' t think of an English word, I use a word or phrase that means the same thing.

l. Never or almost never true of me

2. Usually not true of me

3. Somewhat true of me

4. Usually true of me

5. Always or almost always true of me

(Write answers on Worksheet)

Part D

30. I try to find as many ways as I can to use my English.

31. I notice my English mistakes and use that information to help me do better.

32. I pay attention when someone is speaking English.

33. I try to find out how to be a better learner of English.

34. I plan my schedule so I will have enough time to study English.

35. I look for people I can talk to in English.

36. I look for opportunities to read as much as possible in English.

37. I have clear goals for improving my English skills.

38. I think about my progress in learning English.

Part E

39. I try to relax whenever I feel afraid of using English.

40. I encourage myself to speak English even when I am afraid of making a mistake.

4l. I give myself a reward or treat when I do well in English.

42. I notice if I am tense or nervous when I am studying or using English.

43. I write down my feelings in a language learning diary.

44. I talk to someone else about how I feel when I am learning English.

l. Never or almost never true of me

2. Usually not true of me

3. Somewhat true of me

4. Usually true of me

5. Always or almost always true of me

(Write answers on Worksheet)

Part F

45. If I do not understand something in English, I ask the other person to slow down or say it again.

46. I ask English speakers to correct me when I talk.

47. I practice English with other students.

48. I ask for help from English speakers.

49. I ask questions in English.

50. I try to learn about the culture of English speakers.

Do you think that you are using learning strategies other than what you have read in the previous 50 items?

Appendix .2

Sample Means and Variances

Sample Means and Variances

The observed means, rounded to three digits:

```
apply(X = SILLDATA[c("Item.1", "Item.2", "Item.3","Item.4", "Item.5", "Item.6", "Item.7", "Item.8", "It
em.9", "Item.10", "Item.11", "Item.12", "Item.13", "Item.14", "Item.15", "Item.16", "Item.17", "Item.1
8", "Item.19", "Item.20", "Item.21", "Item.22", "Item.23", "Item.24","Item.25", "Item.26","Item.27","It
em.28","Item.29","Item.30","Item.31","Item.32","Item.33","Item.34","Item.35","Item.36","Item.37","Item.
38","Item.39","Item.40","Item.41","Item.42","Item.43","Item.44","Item.45","Item.46","Item.47","Item.4
8","Item.49","Item.50")], MARGIN = 2, FUN = function(x) round(mean(x), digits = 3))
```

```
##  Item.1  Item.2  Item.3  Item.4  Item.5  Item.6  Item.7  Item.8  Item.9
##   3.529   3.578   2.886   3.213   2.796   2.424   2.791   2.798   3.019
## Item.10 Item.11 Item.12 Item.13 Item.14 Item.15 Item.16 Item.17 Item.18
##   3.368   3.787   3.746   3.628   3.645   3.897   3.269   3.725   3.583
## Item.19 Item.20 Item.21 Item.22 Item.23 Item.24 Item.25 Item.26 Item.27
##   3.292   3.396   3.462   3.252   3.112   3.475   3.243   2.935   3.260
## Item.28 Item.29 Item.30 Item.31 Item.32 Item.33 Item.34 Item.35 Item.36
##   3.290   3.839   3.716   3.910   4.069   4.017   2.884   3.344   3.140
## Item.37 Item.38 Item.39 Item.40 Item.41 Item.42 Item.43 Item.44 Item.45
##   3.247   3.596   3.075   3.723   2.480   2.903   2.097   2.615   3.624
## Item.46 Item.47 Item.48 Item.49 Item.50
##   3.234   3.200   3.368   4.015   3.697
```

The observed variances (using N in the denominator to match ML estimated output and Mplus example), rounded to three digits:

```
apply(X = SILLDATA[c("Item.1", "Item.2", "Item.3","Item.4", "Item.5", "Item.6", "Item.7", "Item.8", "It
em.9", "Item.10", "Item.11", "Item.12", "Item.13", "Item.14", "Item.15", "Item.16", "Item.17", "Item.1
8", "Item.19", "Item.20", "Item.21", "Item.22", "Item.23", "Item.24","Item.25", "Item.26","Item.27","It
em.28","Item.29","Item.30","Item.31","Item.32","Item.33","Item.34","Item.35","Item.36","Item.37","Item.
38","Item.39","Item.40","Item.41","Item.42","Item.43","Item.44","Item.45","Item.46","Item.47","Item.4
8","Item.49","Item.50")], MARGIN = 2, FUN = function(x) round(var(x, na.rm = TRUE)*464/465, digits =
3))
```

```
##  Item.1  Item.2  Item.3  Item.4  Item.5  Item.6  Item.7  Item.8  Item.9
##   0.748   0.622   1.142   0.968   1.156   1.156   1.038   0.996   1.094
## Item.10 Item.11 Item.12 Item.13 Item.14 Item.15 Item.16 Item.17 Item.18
##   0.723   0.869   0.731   0.763   0.762   0.875   1.095   0.866   0.802
## Item.19 Item.20 Item.21 Item.22 Item.23 Item.24 Item.25 Item.26 Item.27
##   0.899   0.721   0.666   1.001   0.732   0.882   0.864   1.114   0.911
## Item.28 Item.29 Item.30 Item.31 Item.32 Item.33 Item.34 Item.35 Item.36
##   0.881   0.742   0.732   0.439   0.494   0.567   0.980   0.888   1.161
## Item.37 Item.38 Item.39 Item.40 Item.41 Item.42 Item.43 Item.44 Item.45
##   0.909   0.869   1.072   0.734   1.230   1.154   0.780   1.093   0.798
## Item.46 Item.47 Item.48 Item.49 Item.50
##   1.048   0.969   1.011   0.656   0.882
```

Appendix .3

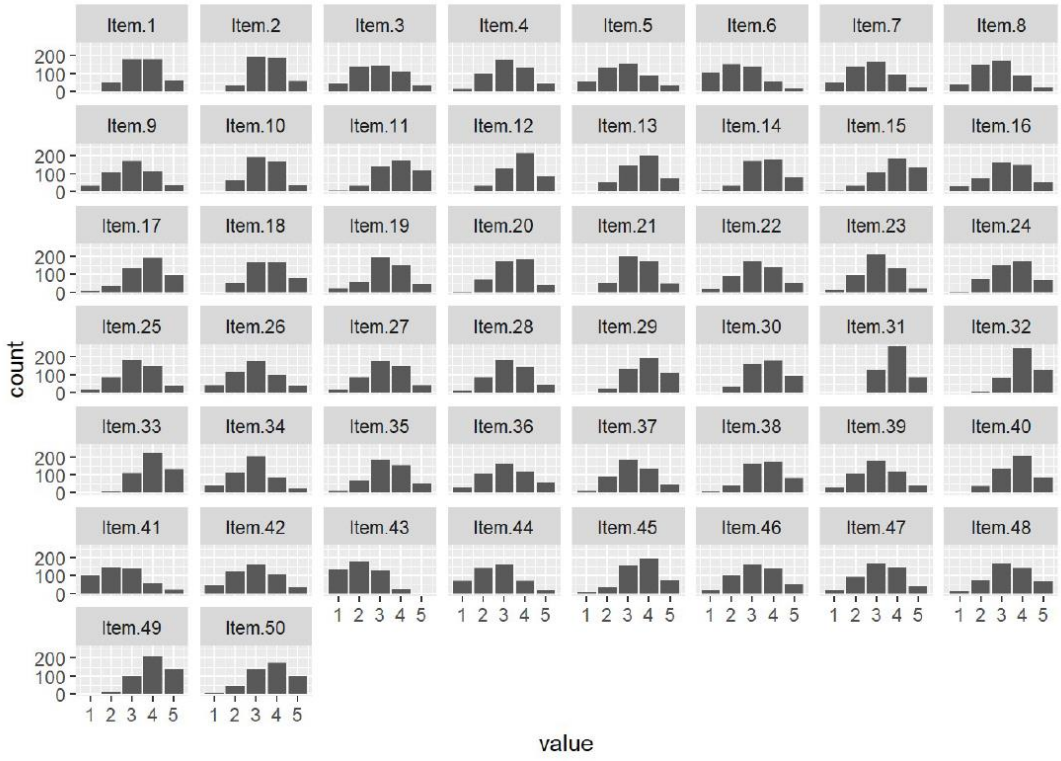
Sample Item Response Distribution

Sample Item Response Distributions

The assumptions of CFA (i.e., normally distributed factors, no item-level factor interactions, and conditionally normal distributed items) lead to the overall assumption that our item responses must be normally distributed. From the histograms below, do you think these are normally distributed?

```
#stack data
melted = melt(SILLDATA, id.vars = "ID")

#plot by variable
ggplot(melted, aes(value)) + geom_bar() + facet_wrap(~ variable)
```



Appendix .4

Sample Correlation Matrix

Observed Sample Statistics

Sample Correlation Matrix

The observed correlation matrix, rounded to three digits:

```
#here the c() function selects only the variables, not the PersionID variable
round(cor(SILLDATA[c("Item.1", "Item.2", "Item.3","Item.4", "Item.5", "Item.6", "Item.7", "Item.8", "Item.9", "Item.10", "Item.11", "Item.12", "Item.13", "Item.14", "Item.15", "Item.16", "Item.17", "Item.18", "Item.19", "Item.20", "Item.21", "Item.22", "Item.23", "Item.24","Item.25", "Item.26","Item.27","Item.28","Item.29","Item.30","Item.31","Item.32","Item.33","Item.34","Item.35","Item.36","Item.37","Item.38","Item.39","Item.40","Item.41","Item.42","Item.43","Item.44","Item.45","Item.46","Item.47","Item.48","Item.49","Item.50")]), digits = 3)
```

```
##         Item.1 Item.2 Item.3 Item.4 Item.5 Item.6 Item.7 Item.8 Item.9
## Item.1   1.000 -0.023 -0.065  0.024  0.003 -0.038  0.028 -0.006 -0.004
## Item.2  -0.023  1.000 -0.014 -0.045  0.000  0.061 -0.069  0.039 -0.001
## Item.3  -0.065 -0.014  1.000  0.023  0.036  0.016 -0.010  0.017  0.033
## Item.4   0.024 -0.045  0.023  1.000  0.057  0.025  0.016  0.033  0.013
## Item.5   0.003  0.000  0.036  0.057  1.000  0.025  0.028 -0.071  0.011
## Item.6  -0.038  0.061  0.016  0.025  0.025  1.000 -0.008 -0.030  0.004
## Item.7   0.028 -0.069 -0.010  0.016  0.028 -0.008  1.000  0.049 -0.057
## Item.8  -0.006  0.039  0.017  0.033 -0.071 -0.030  0.049  1.000  0.037
## Item.9  -0.004 -0.001  0.033  0.013  0.011  0.004 -0.057  0.037  1.000
## Item.10 -0.101 -0.013 -0.020  0.038  0.056  0.015  0.007  0.004 -0.006
## Item.11  0.009 -0.005 -0.039 -0.005 -0.013  0.092  0.010  0.000  0.004
## Item.12  0.042 -0.050  0.013  0.013  0.002 -0.007  0.018 -0.040  0.005
## Item.13 -0.081  0.006 -0.043  0.042  0.102 -0.066 -0.010  0.040  0.013
## Item.14 -0.008 -0.024  0.056  0.153  0.030  0.027  0.001  0.011  0.040
## Item.15 -0.002 -0.007  0.057 -0.025  0.035  0.037 -0.054 -0.055  0.000
## Item.16 -0.036  0.004  0.074 -0.028  0.047 -0.009  0.030 -0.010 -0.007
## Item.17 -0.001 -0.035 -0.083 -0.011  0.049  0.020 -0.065 -0.067  0.005
## Item.18  0.041 -0.115 -0.050 -0.009  0.014 -0.091  0.034 -0.005  0.073
## Item.19  0.087 -0.117  0.046  0.039  0.088 -0.041 -0.013 -0.019 -0.040
## Item.20 -0.039  0.008 -0.059 -0.062 -0.015 -0.075  0.011 -0.045 -0.004
## Item.21  0.004 -0.005  0.060  0.057  0.002 -0.020 -0.003  0.041  0.035
## Item.22 -0.015 -0.073  0.003  0.066  0.016  0.035  0.054 -0.093 -0.044
## Item.23  0.025  0.038  0.037  0.023 -0.076 -0.066  0.007  0.067  0.062
## Item.24  0.032 -0.061  0.058 -0.014 -0.081  0.007  0.063 -0.003  0.043
## Item.25  0.009  0.008  0.004  0.005  0.063 -0.017  0.013  0.081 -0.029
## Item.26  0.002 -0.004 -0.027  0.048  0.019  0.017 -0.098 -0.016  0.048
## Item.27 -0.091 -0.023  0.014  0.072  0.018 -0.072 -0.041 -0.073  0.032
## Item.28 -0.030 -0.024  0.125 -0.055  0.016  0.021  0.016  0.014 -0.065
## Item.29 -0.059  0.084  0.031  0.061 -0.010  0.065  0.033  0.022 -0.016
## Item.30  0.026 -0.005  0.021 -0.064  0.068  0.056  0.046  0.084 -0.056
## Item.31 -0.070 -0.040 -0.002  0.066  0.059  0.036 -0.037  0.031  0.034
## Item.32  0.043 -0.037  0.056  0.016 -0.013 -0.007  0.068  0.093  0.007
## Item.33  0.012 -0.028  0.018 -0.031 -0.017 -0.123 -0.054 -0.081 -0.104
## Item.34  0.037 -0.154 -0.126 -0.036  0.073 -0.065  0.014 -0.024  0.025
## Item.35  0.025 -0.083  0.013  0.053  0.004  0.030  0.077 -0.068 -0.011
## Item.36 -0.040 -0.034 -0.035 -0.067 -0.048 -0.055  0.001  0.002 -0.010
## Item.37  0.058  0.047 -0.019 -0.001  0.156 -0.008  0.018  0.021  0.097
## Item.38 -0.017  0.002  0.010 -0.066  0.021  0.023  0.088  0.005  0.021
## Item.39  0.001 -0.066 -0.033 -0.073  0.043 -0.065 -0.010 -0.039 -0.051
## Item.40 -0.075  0.040 -0.002  0.052 -0.036 -0.090  0.025  0.010  0.013
## Item.41  0.016 -0.020 -0.048  0.042  0.057  0.100 -0.012 -0.046 -0.021
## Item.42  0.006  0.020  0.058 -0.019 -0.023  0.032 -0.013  0.040  0.044
## Item.43 -0.014 -0.022 -0.013 -0.026 -0.065 -0.011 -0.028  0.020  0.005
## Item.44 -0.051  0.059 -0.020 -0.029 -0.039 -0.033 -0.017  0.024  0.078
## Item.45  0.041 -0.054 -0.018 -0.031  0.016 -0.022  0.004  0.057 -0.020
## Item.46  0.008  0.098  0.013  0.019 -0.046 -0.028  0.041 -0.002  0.068
## Item.47  0.035 -0.027  0.032  0.043 -0.043  0.005  0.069  0.019 -0.048
## Item.48  0.090  0.117 -0.021 -0.010 -0.090 -0.029 -0.087 -0.014  0.081
## Item.49 -0.011  0.023 -0.035  0.039  0.026 -0.126  0.090  0.054  0.010
## Item.50 -0.038 -0.019  0.017  0.019 -0.008 -0.043  0.001  0.107  0.059
##         Item.10 Item.11 Item.12 Item.13 Item.14 Item.15 Item.16 Item.17
## Item.1   -0.101   0.009   0.042  -0.081  -0.008  -0.002  -0.036  -0.001
## Item.2   -0.013  -0.005  -0.050   0.006  -0.024  -0.007   0.004  -0.035
## Item.3   -0.020  -0.039   0.013  -0.043   0.056   0.057   0.074  -0.083
## Item.4    0.038  -0.005   0.013   0.042   0.153  -0.025  -0.028  -0.011
## Item.5    0.056  -0.013   0.002   0.102   0.030   0.035   0.047   0.049
```

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## Item.6    0.015   0.092  -0.007  -0.066   0.027   0.037  -0.009   0.020
## Item.7    0.007   0.010   0.018  -0.010   0.001  -0.054   0.030  -0.065
## Item.8    0.004   0.000  -0.040   0.040   0.011  -0.055  -0.010  -0.067
## Item.9   -0.006   0.004   0.005   0.013   0.040   0.000  -0.007   0.005
## Item.10   1.000  -0.010  -0.022  -0.036  -0.021   0.007   0.024   0.000
## Item.11  -0.010   1.000  -0.003   0.037   0.013  -0.109   0.050   0.002
## Item.12  -0.022  -0.003   1.000   0.018  -0.028   0.061  -0.030  -0.018
## Item.13  -0.036   0.037   0.018   1.000   0.092  -0.089  -0.034  -0.020
## Item.14  -0.021   0.013  -0.028   0.092   1.000  -0.008  -0.053  -0.051
## Item.15   0.007  -0.109   0.061  -0.089  -0.008   1.000   0.026  -0.015
## Item.16   0.024   0.050  -0.030  -0.034  -0.053   0.026   1.000  -0.001
## Item.17   0.000   0.002  -0.018  -0.020  -0.051  -0.015  -0.001   1.000
## Item.18  -0.002  -0.011  -0.074   0.041  -0.041   0.036  -0.059   0.076
## Item.19   0.072  -0.039  -0.036  -0.019  -0.010   0.024  -0.019   0.038
## Item.20  -0.050   0.022   0.044   0.074   0.001  -0.046  -0.040   0.024
## Item.21  -0.037  -0.043   0.029  -0.018   0.031  -0.028  -0.022  -0.062
## Item.22  -0.046   0.004   0.039   0.016   0.048  -0.002  -0.044   0.044
## Item.23   0.091   0.022   0.039  -0.042  -0.039  -0.026   0.024   0.071
## Item.24  -0.009   0.017  -0.085   0.003  -0.002  -0.022  -0.003  -0.037
## Item.25   0.026   0.003  -0.023   0.093   0.006  -0.008   0.001   0.052
## Item.26   0.036   0.019  -0.123  -0.066   0.026  -0.011  -0.019   0.032
## Item.27  -0.020  -0.044   0.086   0.077   0.057  -0.004   0.044  -0.021
## Item.28  -0.050  -0.092  -0.007  -0.010  -0.100   0.061  -0.016   0.035
## Item.29   0.011  -0.003  -0.021  -0.043  -0.025   0.009  -0.062  -0.106
## Item.30   0.049   0.054   0.128   0.049   0.009  -0.023   0.064  -0.036
## Item.31   0.044  -0.007  -0.086  -0.032  -0.037  -0.036   0.023   0.054
## Item.32  -0.028  -0.017   0.036  -0.049  -0.023   0.112  -0.005   0.003
## Item.33   0.010  -0.053  -0.033  -0.007  -0.020   0.012  -0.006   0.068
## Item.34   0.064   0.043   0.013   0.020   0.015  -0.013   0.005  -0.018
## Item.35  -0.002  -0.022  -0.070   0.009   0.070  -0.023   0.052   0.069
## Item.36  -0.004  -0.011   0.024  -0.059   0.005  -0.005  -0.047  -0.037
## Item.37   0.068  -0.023   0.085   0.030   0.077   0.079  -0.011   0.031
## Item.38   0.071  -0.007   0.041   0.050   0.077  -0.055   0.116  -0.074
## Item.39  -0.053  -0.073  -0.122  -0.007  -0.004  -0.005  -0.048   0.037
## Item.40   0.063   0.090   0.030  -0.078  -0.080  -0.049   0.050   0.026
## Item.41   0.005   0.018  -0.026   0.044   0.034   0.031   0.076  -0.047
## Item.42   0.030  -0.053  -0.027  -0.029   0.000   0.123  -0.059   0.027
## Item.43   0.021   0.022  -0.022   0.005   0.047  -0.061  -0.049  -0.051
## Item.44   0.002   0.022  -0.020  -0.020   0.022   0.050   0.069  -0.069
## Item.45  -0.027  -0.016   0.013   0.027   0.074   0.044   0.041  -0.031
## Item.46  -0.008   0.034  -0.023   0.071  -0.078  -0.067   0.044  -0.007
## Item.47  -0.013  -0.083  -0.024  -0.049  -0.058  -0.006   0.006   0.001
## Item.48  -0.037   0.081   0.076  -0.028   0.058   0.040   0.035   0.058
## Item.49  -0.002  -0.056  -0.032  -0.019   0.090   0.033   0.079  -0.017
## Item.50   0.080   0.034  -0.096   0.017   0.042  -0.053   0.068   0.015
##         Item.18 Item.19 Item.20 Item.21 Item.22 Item.23 Item.24 Item.25
## Item.1    0.041   0.087  -0.039   0.004  -0.015   0.025   0.032   0.009
## Item.2   -0.115  -0.117   0.008  -0.005  -0.073   0.038  -0.061   0.008
## Item.3   -0.050   0.046  -0.059   0.060   0.003   0.037   0.058   0.004
## Item.4   -0.009   0.039  -0.062   0.057   0.066   0.023  -0.014   0.005
## Item.5    0.014   0.088  -0.015   0.002   0.016  -0.076  -0.081   0.063
## Item.6   -0.091  -0.041  -0.075  -0.020   0.035  -0.066   0.007  -0.017
## Item.7    0.034  -0.013   0.011  -0.003   0.054   0.007   0.063   0.013
## Item.8   -0.005  -0.019  -0.045   0.041  -0.093   0.067  -0.003   0.081
## Item.9    0.073  -0.040  -0.004   0.035  -0.044   0.062   0.043  -0.029
## Item.10  -0.002   0.072  -0.050  -0.037  -0.046   0.091  -0.009   0.026
## Item.11  -0.011  -0.039   0.022  -0.043   0.004   0.022   0.017   0.003
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## Item.12  -0.074  -0.036   0.044   0.029   0.039   0.039  -0.085  -0.023
## Item.13   0.041  -0.019   0.074  -0.018   0.016  -0.042   0.003   0.093
## Item.14  -0.041  -0.010   0.001   0.031   0.048  -0.039  -0.002   0.006
## Item.15   0.036   0.024  -0.046  -0.028  -0.002  -0.026  -0.022  -0.008
## Item.16  -0.059  -0.019  -0.040  -0.022  -0.044   0.024  -0.003   0.001
## Item.17   0.076   0.038   0.024  -0.062   0.044   0.071  -0.037   0.052
## Item.18   1.000   0.060   0.081  -0.001   0.048   0.019   0.062   0.068
## Item.19   0.060   1.000  -0.010  -0.036  -0.005  -0.051  -0.009   0.051
## Item.20   0.081  -0.010   1.000  -0.065   0.057  -0.017  -0.044   0.042
## Item.21  -0.001  -0.036  -0.065   1.000   0.034   0.031  -0.071   0.022
## Item.22   0.048  -0.005   0.057   0.034   1.000  -0.013  -0.024   0.036
## Item.23   0.019  -0.051  -0.017   0.031  -0.013   1.000  -0.072   0.088
## Item.24   0.062  -0.009  -0.044  -0.071  -0.024  -0.072   1.000  -0.066
## Item.25   0.068   0.051   0.042   0.022   0.036   0.088  -0.066   1.000
## Item.26  -0.006  -0.013  -0.048  -0.105   0.001  -0.049  -0.058  -0.006
## Item.27  -0.006  -0.084  -0.024   0.019  -0.015  -0.086  -0.059  -0.028
## Item.28   0.016  -0.011  -0.060   0.055  -0.034  -0.043  -0.039   0.047
## Item.29  -0.015  -0.077   0.017   0.042   0.047  -0.028   0.039   0.003
## Item.30   0.042   0.020   0.051  -0.025   0.058  -0.012   0.034  -0.002
## Item.31   0.016  -0.109  -0.040  -0.042  -0.011   0.056  -0.014   0.025
## Item.32  -0.060  -0.030  -0.010  -0.078  -0.052   0.030   0.006  -0.105
## Item.33  -0.012   0.116   0.006  -0.079   0.037  -0.010  -0.048  -0.015
## Item.34   0.062   0.029   0.121  -0.027   0.038   0.010  -0.061  -0.009
## Item.35  -0.046   0.087  -0.004  -0.006   0.050   0.003   0.027   0.037
## Item.36  -0.015  -0.069  -0.028   0.127  -0.061   0.018   0.102   0.003
## Item.37   0.023   0.058   0.057  -0.003  -0.067  -0.021   0.020   0.010
## Item.38  -0.063  -0.012   0.006  -0.020  -0.066   0.014   0.052  -0.078
## Item.39   0.043   0.024   0.013   0.035   0.090   0.007   0.005  -0.019
## Item.40   0.017   0.005  -0.032   0.036   0.026   0.089  -0.058  -0.018
## Item.41  -0.004  -0.019  -0.067   0.009  -0.016   0.052  -0.072   0.039
## Item.42   0.021  -0.010   0.070   0.044  -0.013  -0.051  -0.059   0.110
## Item.43  -0.011  -0.062   0.003  -0.008   0.007   0.108  -0.017  -0.052
## Item.44  -0.089  -0.027   0.101  -0.021  -0.097   0.019   0.015   0.132
## Item.45  -0.024   0.036  -0.042  -0.006   0.041  -0.057  -0.030  -0.030
## Item.46  -0.029   0.014   0.007  -0.045   0.039  -0.013  -0.029  -0.051
## Item.47   0.007  -0.037  -0.061  -0.091  -0.064  -0.039  -0.005  -0.025
## Item.48  -0.030  -0.061  -0.052   0.042  -0.002  -0.025  -0.042   0.077
## Item.49   0.009  -0.020   0.054   0.038  -0.005   0.032  -0.001   0.015
## Item.50  -0.010   0.039  -0.054   0.045  -0.081   0.037   0.037   0.077
##         Item.26 Item.27 Item.28 Item.29 Item.30 Item.31 Item.32 Item.33
## Item.1    0.002  -0.091  -0.030  -0.059   0.026  -0.070   0.043   0.012
## Item.2   -0.004  -0.023  -0.024   0.084  -0.005  -0.040  -0.037  -0.028
## Item.3   -0.027   0.014   0.125   0.031   0.021  -0.002   0.056   0.018
## Item.4    0.048   0.072  -0.055   0.061  -0.064   0.066   0.016  -0.031
## Item.5    0.019   0.018   0.016  -0.010   0.068   0.059  -0.013  -0.017
## Item.6    0.017  -0.072   0.021   0.065   0.056   0.036  -0.007  -0.123
## Item.7   -0.098  -0.041   0.016   0.033   0.046  -0.037   0.068  -0.054
## Item.8   -0.016  -0.073   0.014   0.022   0.084   0.031   0.093  -0.081
## Item.9    0.048   0.032  -0.065  -0.016  -0.056   0.034   0.007  -0.104
## Item.10   0.036  -0.020  -0.050   0.011   0.049   0.044  -0.028   0.010
## Item.11   0.019  -0.044  -0.092  -0.003   0.054  -0.007  -0.017  -0.053
## Item.12  -0.123   0.086  -0.007  -0.021   0.128  -0.086   0.036  -0.033
## Item.13  -0.066   0.077  -0.010  -0.043   0.049  -0.032  -0.049  -0.007
## Item.14   0.026   0.057  -0.100  -0.025   0.009  -0.037  -0.023  -0.020
## Item.15  -0.011  -0.004   0.061   0.009  -0.023  -0.036   0.112   0.012
## Item.16  -0.019   0.044  -0.016  -0.062   0.064   0.023  -0.005  -0.006
## Item.17   0.032  -0.021   0.035  -0.106  -0.036   0.054   0.003   0.068
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## Item.18  -0.006  -0.006   0.016  -0.015   0.042   0.016  -0.060  -0.012
## Item.19  -0.013  -0.084  -0.011  -0.077   0.020  -0.109  -0.030   0.116
## Item.20  -0.048  -0.024  -0.060   0.017   0.051  -0.040  -0.010   0.006
## Item.21  -0.105   0.019   0.055   0.042  -0.025  -0.042  -0.078  -0.079
## Item.22   0.001  -0.015  -0.034   0.047   0.058  -0.011  -0.052   0.037
## Item.23  -0.049  -0.086  -0.043  -0.028  -0.012   0.056   0.030  -0.010
## Item.24  -0.058  -0.059  -0.039   0.039   0.034  -0.014   0.006  -0.048
## Item.25  -0.006  -0.028   0.047   0.003  -0.002   0.025  -0.105  -0.015
## Item.26   1.000   0.066   0.010  -0.021  -0.042  -0.002   0.018  -0.074
## Item.27   0.066   1.000  -0.106   0.059   0.011   0.037  -0.004   0.003
## Item.28   0.010  -0.106   1.000   0.031  -0.061   0.049   0.035   0.026
## Item.29  -0.021   0.059   0.031   1.000   0.008   0.012   0.029  -0.055
## Item.30  -0.042   0.011  -0.061   0.008   1.000   0.091  -0.018   0.041
## Item.31  -0.002   0.037   0.049   0.012   0.091   1.000  -0.037   0.046
## Item.32   0.018  -0.004   0.035   0.029  -0.018  -0.037   1.000   0.059
## Item.33  -0.074   0.003   0.026  -0.055   0.041   0.046   0.059   1.000
## Item.34   0.022   0.009  -0.026   0.023  -0.092   0.000   0.055  -0.061
## Item.35   0.096   0.030  -0.006   0.007  -0.039  -0.016   0.101  -0.011
## Item.36   0.053   0.059   0.058  -0.061   0.052  -0.067   0.087  -0.029
## Item.37  -0.048  -0.057   0.093   0.017  -0.001  -0.009   0.026  -0.030
## Item.38  -0.121  -0.034  -0.048   0.039   0.074  -0.045   0.036  -0.015
## Item.39   0.063  -0.055   0.084  -0.020  -0.066   0.004   0.002  -0.024
## Item.40   0.023   0.033  -0.068  -0.040  -0.040   0.054  -0.025   0.077
## Item.41   0.032   0.020  -0.097  -0.074  -0.011   0.038   0.087  -0.010
## Item.42  -0.078  -0.034   0.073  -0.028  -0.035   0.054   0.029  -0.046
## Item.43   0.057  -0.068   0.034  -0.005   0.102   0.052  -0.066   0.049
## Item.44   0.016   0.044   0.042  -0.019  -0.096  -0.010   0.054  -0.011
## Item.45   0.036   0.080  -0.057  -0.003   0.040  -0.054   0.031  -0.010
## Item.46   0.004   0.052  -0.013   0.014  -0.039   0.050   0.010   0.042
## Item.47  -0.037  -0.062  -0.065  -0.033  -0.032   0.051   0.030   0.021
## Item.48   0.037  -0.010  -0.013  -0.033  -0.061  -0.089  -0.005  -0.057
## Item.49  -0.022   0.098   0.071   0.111   0.006   0.047   0.040   0.014
## Item.50  -0.002   0.064   0.039   0.046   0.048   0.029   0.067   0.007
##         Item.34 Item.35 Item.36 Item.37 Item.38 Item.39 Item.40 Item.41
## Item.1    0.037   0.025  -0.040   0.058  -0.017   0.001  -0.075   0.016
## Item.2   -0.154  -0.083  -0.034   0.047   0.002  -0.066   0.040  -0.020
## Item.3   -0.126   0.013  -0.035  -0.019   0.010  -0.033  -0.002  -0.048
## Item.4   -0.036   0.053  -0.067  -0.001  -0.066  -0.073   0.052   0.042
## Item.5    0.073   0.004  -0.048   0.156   0.021   0.043  -0.036   0.057
## Item.6   -0.065   0.030  -0.055  -0.008   0.023  -0.065  -0.090   0.100
## Item.7    0.014   0.077   0.001   0.018   0.088  -0.010   0.025  -0.012
## Item.8   -0.024  -0.068   0.002   0.021   0.005  -0.039   0.010  -0.046
## Item.9    0.025  -0.011  -0.010   0.097   0.021  -0.051   0.013  -0.021
## Item.10   0.064  -0.002  -0.004   0.068   0.071  -0.053   0.063   0.005
## Item.11   0.043  -0.022  -0.011  -0.023  -0.007  -0.073   0.090   0.018
## Item.12   0.013  -0.070   0.024   0.085   0.041  -0.122   0.030  -0.026
## Item.13   0.020   0.009  -0.059   0.030   0.050  -0.007  -0.078   0.044
## Item.14   0.015   0.070   0.005   0.077   0.077  -0.004  -0.080   0.034
## Item.15  -0.013  -0.023  -0.005   0.079  -0.055  -0.005  -0.049   0.031
## Item.16   0.005   0.052  -0.047  -0.011   0.116  -0.048   0.050   0.076
## Item.17  -0.018   0.069  -0.037   0.031  -0.074   0.037   0.026  -0.047
## Item.18   0.062  -0.046  -0.015   0.023  -0.063   0.043   0.017  -0.004
## Item.19   0.029   0.087  -0.069   0.058  -0.012   0.024   0.005  -0.019
## Item.20   0.121  -0.004  -0.028   0.057   0.006   0.013  -0.032  -0.067
## Item.21  -0.027  -0.006   0.127  -0.003  -0.020   0.035   0.036   0.009
## Item.22   0.038   0.050  -0.061  -0.067  -0.066   0.090   0.026  -0.016
## Item.23   0.010   0.003   0.018  -0.021   0.014   0.007   0.089   0.052
```

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## Item.24  -0.061   0.027   0.102   0.020   0.052   0.005  -0.058  -0.072
## Item.25  -0.009   0.037   0.003   0.010  -0.078  -0.019  -0.018   0.039
## Item.26   0.022   0.096   0.053  -0.048  -0.121   0.063   0.023   0.032
## Item.27   0.009   0.030   0.059  -0.057  -0.034  -0.055   0.033   0.020
## Item.28  -0.026  -0.006   0.058   0.093  -0.048   0.084  -0.068  -0.097
## Item.29   0.023   0.007  -0.061   0.017   0.039  -0.020  -0.040  -0.074
## Item.30  -0.092  -0.039   0.052  -0.001   0.074  -0.066  -0.040  -0.011
## Item.31   0.000  -0.016  -0.067  -0.009  -0.045   0.004   0.054   0.038
## Item.32   0.055   0.101   0.087   0.026   0.036   0.002  -0.025   0.087
## Item.33  -0.061  -0.011  -0.029  -0.030  -0.015  -0.024   0.077  -0.010
## Item.34   1.000   0.054  -0.039   0.033   0.042   0.084  -0.063   0.002
## Item.35   0.054   1.000   0.008   0.032   0.048   0.033   0.041   0.068
## Item.36  -0.039   0.008   1.000  -0.021   0.033  -0.013   0.040  -0.115
## Item.37   0.033   0.032  -0.021   1.000   0.054  -0.095   0.000   0.077
## Item.38   0.042   0.048   0.033   0.054   1.000  -0.022  -0.014   0.032
## Item.39   0.084   0.033  -0.013  -0.095  -0.022   1.000  -0.047   0.060
## Item.40  -0.063   0.041   0.040   0.000  -0.014  -0.047   1.000   0.004
## Item.41   0.002   0.068  -0.115   0.077   0.032   0.060   0.004   1.000
## Item.42   0.038  -0.041  -0.018   0.124  -0.003   0.036   0.036  -0.030
## Item.43   0.055  -0.004   0.008   0.015  -0.033   0.008  -0.010   0.021
## Item.44  -0.012  -0.027  -0.011   0.031   0.054  -0.017  -0.006   0.013
## Item.45   0.021   0.026   0.037  -0.090   0.037   0.003   0.001   0.050
## Item.46  -0.001  -0.068  -0.034  -0.059  -0.007   0.081  -0.002  -0.076
## Item.47  -0.038  -0.046  -0.045   0.025  -0.010  -0.038  -0.031  -0.113
## Item.48   0.030   0.025  -0.065   0.042  -0.013   0.002   0.034   0.102
## Item.49   0.024   0.041   0.052   0.090   0.039  -0.001  -0.056  -0.001
## Item.50  -0.017   0.021   0.042   0.089   0.066   0.041  -0.080   0.069
##         Item.42 Item.43 Item.44 Item.45 Item.46 Item.47 Item.48 Item.49
## Item.1    0.006  -0.014  -0.051   0.041   0.008   0.035   0.090  -0.011
## Item.2    0.020  -0.022   0.059  -0.054   0.098  -0.027   0.117   0.023
## Item.3    0.058  -0.013  -0.020  -0.018   0.013   0.032  -0.021  -0.035
## Item.4   -0.019  -0.026  -0.029  -0.031   0.019   0.043  -0.010   0.039
## Item.5   -0.023  -0.065  -0.039   0.016  -0.046  -0.043  -0.090   0.026
## Item.6    0.032  -0.011  -0.033  -0.022  -0.028   0.005  -0.029  -0.126
## Item.7   -0.013  -0.028  -0.017   0.004   0.041   0.069  -0.087   0.090
## Item.8    0.040   0.020   0.024   0.057  -0.002   0.019  -0.014   0.054
## Item.9    0.044   0.005   0.078  -0.020   0.068  -0.048   0.081   0.010
## Item.10   0.030   0.021   0.002  -0.027  -0.008  -0.013  -0.037  -0.002
## Item.11  -0.053   0.022   0.022  -0.016   0.034  -0.083   0.081  -0.056
## Item.12  -0.027  -0.022  -0.020   0.013  -0.023  -0.024   0.076  -0.032
## Item.13  -0.029   0.005  -0.020   0.027   0.071  -0.049  -0.028  -0.019
## Item.14   0.000   0.047   0.022   0.074  -0.078  -0.058   0.058   0.090
## Item.15   0.123  -0.061   0.050   0.044  -0.067  -0.006   0.040   0.033
## Item.16  -0.059  -0.049   0.069   0.041   0.044   0.006   0.035   0.079
## Item.17   0.027  -0.051  -0.069  -0.031  -0.007   0.001   0.058  -0.017
## Item.18   0.021  -0.011  -0.089  -0.024  -0.029   0.007  -0.030   0.009
## Item.19  -0.010  -0.062  -0.027   0.036   0.014  -0.037  -0.061  -0.020
## Item.20   0.070   0.003   0.101  -0.042   0.007  -0.061  -0.052   0.054
## Item.21   0.044  -0.008  -0.021  -0.006  -0.045  -0.091   0.042   0.038
## Item.22  -0.013   0.007  -0.097   0.041   0.039  -0.064  -0.002  -0.005
## Item.23  -0.051   0.108   0.019  -0.057  -0.013  -0.039  -0.025   0.032
## Item.24  -0.059  -0.017   0.015  -0.030  -0.029  -0.005  -0.042  -0.001
## Item.25   0.110  -0.052   0.132  -0.030  -0.051  -0.025   0.077   0.015
## Item.26  -0.078   0.057   0.016   0.036   0.004  -0.037   0.037  -0.022
## Item.27  -0.034  -0.068   0.044   0.080   0.052  -0.062  -0.010   0.098
## Item.28   0.073   0.034   0.042  -0.057  -0.013  -0.065  -0.013   0.071
## Item.29  -0.028  -0.005  -0.019  -0.003   0.014  -0.033  -0.033   0.111
```

```
## Item.30  -0.035   0.102  -0.096   0.040  -0.039  -0.032  -0.061   0.006
## Item.31   0.054   0.052  -0.010  -0.054   0.050   0.051  -0.089   0.047
## Item.32   0.029  -0.066   0.054   0.031   0.010   0.030  -0.005   0.040
## Item.33  -0.046   0.049  -0.011  -0.010   0.042   0.021  -0.057   0.014
## Item.34   0.038   0.055  -0.012   0.021  -0.001  -0.038   0.030   0.024
## Item.35  -0.041  -0.004  -0.027   0.026  -0.068  -0.046   0.025   0.041
## Item.36  -0.018   0.008  -0.011   0.037  -0.034  -0.045  -0.065   0.052
## Item.37   0.124   0.015   0.031  -0.090  -0.059   0.025   0.042   0.090
## Item.38  -0.003  -0.033   0.054   0.037  -0.007  -0.010  -0.013   0.039
## Item.39   0.036   0.008  -0.017   0.003   0.081  -0.038   0.002  -0.001
## Item.40   0.036  -0.010  -0.006   0.001  -0.002  -0.031   0.034  -0.056
## Item.41  -0.030   0.021   0.013   0.050  -0.076  -0.113   0.102  -0.001
## Item.42   1.000  -0.076   0.078  -0.042  -0.001  -0.049   0.182  -0.013
## Item.43  -0.076   1.000   0.008  -0.022  -0.023  -0.052   0.030  -0.032
## Item.44   0.078   0.008   1.000  -0.001   0.022  -0.080  -0.045   0.098
## Item.45  -0.042  -0.022  -0.001   1.000  -0.059  -0.015   0.001   0.145
## Item.46  -0.001  -0.023   0.022  -0.059   1.000   0.028   0.017   0.001
## Item.47  -0.049  -0.052  -0.080  -0.015   0.028   1.000  -0.050   0.012
## Item.48   0.182   0.030  -0.045   0.001   0.017  -0.050   1.000  -0.036
## Item.49  -0.013  -0.032   0.098   0.145   0.001   0.012  -0.036   1.000
## Item.50  -0.112   0.033  -0.009  -0.036  -0.092  -0.044   0.029   0.017
##         Item.50
## Item.1   -0.038
## Item.2   -0.019
## Item.3    0.017
## Item.4    0.019
## Item.5   -0.008
## Item.6   -0.043
## Item.7    0.001
## Item.8    0.107
## Item.9    0.059
## Item.10   0.080
## Item.11   0.034
## Item.12  -0.096
## Item.13   0.017
## Item.14   0.042
## Item.15  -0.053
## Item.16   0.068
## Item.17   0.015
## Item.18  -0.010
## Item.19   0.039
## Item.20  -0.054
## Item.21   0.045
## Item.22  -0.081
## Item.23   0.037
## Item.24   0.037
## Item.25   0.077
## Item.26  -0.002
## Item.27   0.064
## Item.28   0.039
## Item.29   0.046
## Item.30   0.048
## Item.31   0.029
## Item.32   0.067
## Item.33   0.007
## Item.34  -0.017
## Item.35   0.021
```

```
## Item.36   0.042
## Item.37   0.089
## Item.38   0.066
## Item.39   0.041
## Item.40  -0.080
## Item.41   0.069
## Item.42  -0.112
## Item.43   0.033
## Item.44  -0.009
## Item.45  -0.036
## Item.46  -0.092
## Item.47  -0.044
## Item.48   0.029
## Item.49   0.017
## Item.50   1.000
```

Appendix .5

Sample Covariances

Sample Covariances

To do a CFA analysis, you only really need means, variances, and either correlations or covariances among items. That said, modern methods of estimation use the raw data (often called full information) rather than the summary statistics as the raw data enable better missing data assumptions when using maximum likelihood and Bayesian estimation methods.

The sample covariance matrix can be found from the sample correlations and variances. Each covariance between a pair of variables y_1 and y_2 is denoted with a σ_{y_1,y_2} and each correlation is denoted with a ρ_{y_1,y_2} . The variance of a variable is denoted by $\sigma^2_{y_1}$ and the standard deviation of a variable is the square root of the variance $\sqrt{\sigma^2_{y_1}}$. The covariance can be found by taking the correlation and multiplying it by the product of the standard deviations.

$$\sigma_{y_1,y_2} = \rho_{y_1,y_2}\sqrt{\sigma^2_{y_1}}\sqrt{\sigma^2_{y_2}}. \tag{1}$$

Inversely, the correlation can be found by taking the covariance and dividing it by the product of the standard deviations:

$$\rho_{y_1,y_2} = \frac{\sigma_{y_1,y_2}}{\sqrt{\sigma^2_{y_1}}\sqrt{\sigma^2_{y_2}}}. \tag{2}$$

Again, we change the denominator from $N-1$ to N to be consistent with the Mplus example, which calculates covariances using maximum likelihood.

```
round(cov(SILLDATA[c("Item.1", "Item.2", "Item.3","Item.4", "Item.5", "Item.6", "Item.7", "Item.8", "Item.9", "Item.10", "Item.11", "Item.12", "Item.13", "Item.14", "Item.15", "Item.16", "Item.17", "Item.18", "Item.19", "Item.20", "Item.21", "Item.22", "Item.23", "Item.24","Item.25", "Item.26","Item.27","Item.28","Item.29","Item.30","Item.31","Item.32","Item.33","Item.34","Item.35","Item.36","Item.37","Item.38","Item.39","Item.40","Item.41","Item.42","Item.43","Item.44","Item.45","Item.46","Item.47","Item.48","Item.49","Item.50")])*464/465, digits = 3)
```

```
##         Item.1 Item.2 Item.3 Item.4 Item.5 Item.6 Item.7 Item.8 Item.9
## Item.1   0.748 -0.016 -0.060  0.021  0.003 -0.035  0.024 -0.005 -0.004
## Item.2  -0.016  0.622 -0.011 -0.035  0.000  0.052 -0.056  0.031  0.000
## Item.3  -0.060 -0.011  1.142  0.024  0.041  0.018 -0.011  0.018  0.037
## Item.4   0.021 -0.035  0.024  0.968  0.061  0.026  0.016  0.032  0.013
## Item.5   0.003  0.000  0.041  0.061  1.156  0.028  0.031 -0.076  0.013
## Item.6  -0.035  0.052  0.018  0.026  0.028  1.156 -0.008 -0.033  0.005
## Item.7   0.024 -0.056 -0.011  0.016  0.031 -0.008  1.038  0.050 -0.060
## Item.8  -0.005  0.031  0.018  0.032 -0.076 -0.033  0.050  0.996  0.038
## Item.9  -0.004  0.000  0.037  0.013  0.013  0.005 -0.060  0.038  1.094
## Item.10 -0.074 -0.008 -0.018  0.031  0.051  0.014  0.006  0.003 -0.005
## Item.11  0.007 -0.004 -0.039 -0.004 -0.013  0.092  0.009  0.000  0.004
## Item.12  0.031 -0.034  0.012  0.011  0.002 -0.006  0.016 -0.034  0.005
## Item.13 -0.061  0.004 -0.040  0.036  0.096 -0.062 -0.009  0.034  0.012
## Item.14 -0.006 -0.016  0.052  0.131  0.029  0.026  0.001  0.010  0.037
## Item.15 -0.001 -0.005  0.057 -0.023  0.035  0.037 -0.052 -0.051  0.000
## Item.16 -0.033  0.004  0.082 -0.029  0.053 -0.011  0.032 -0.010 -0.007
## Item.17 -0.001 -0.026 -0.083 -0.010  0.049  0.020 -0.062 -0.062  0.005
## Item.18  0.031 -0.081 -0.048 -0.008  0.014 -0.088  0.031 -0.005  0.068
## Item.19  0.071 -0.087  0.046  0.037  0.090 -0.042 -0.012 -0.018 -0.040
## Item.20 -0.029  0.005 -0.054 -0.052 -0.014 -0.069  0.009 -0.038 -0.003
## Item.21  0.003 -0.003  0.053  0.046  0.002 -0.017 -0.002  0.033  0.030
## Item.22 -0.013 -0.057  0.003  0.065  0.017  0.037  0.055 -0.093 -0.046
## Item.23  0.018  0.026  0.034  0.019 -0.070 -0.060  0.006  0.057  0.056
## Item.24  0.026 -0.045  0.058 -0.013 -0.081  0.007  0.060 -0.003  0.042
## Item.25  0.007  0.006  0.004  0.004  0.063 -0.017  0.012  0.075 -0.028
## Item.26  0.002 -0.004 -0.031  0.050  0.021  0.019 -0.106 -0.017  0.053
## Item.27 -0.075 -0.017  0.015  0.067  0.019 -0.074 -0.040 -0.070  0.032
## Item.28 -0.025 -0.017  0.126 -0.051  0.016  0.021  0.015  0.014 -0.064
## Item.29 -0.044  0.057  0.029  0.052 -0.009  0.060  0.029  0.019 -0.014
## Item.30  0.019 -0.004  0.019 -0.054  0.062  0.051  0.040  0.072 -0.050
## Item.31 -0.040 -0.021 -0.002  0.043  0.042  0.025 -0.025  0.020  0.023
## Item.32  0.026 -0.020  0.042  0.011 -0.010 -0.005  0.049  0.066  0.005
## Item.33  0.008 -0.016  0.015 -0.023 -0.014 -0.100 -0.042 -0.061 -0.082
## Item.34  0.031 -0.120 -0.134 -0.035  0.077 -0.069  0.014 -0.023  0.026
## Item.35  0.020 -0.061  0.013  0.049  0.004  0.031  0.074 -0.064 -0.011
## Item.36 -0.037 -0.029 -0.040 -0.071 -0.055 -0.064  0.001  0.002 -0.011
## Item.37  0.048  0.035 -0.019 -0.001  0.160 -0.008  0.017  0.020  0.096
## Item.38 -0.014  0.002  0.010 -0.060  0.021  0.023  0.083  0.004  0.021
## Item.39  0.001 -0.054 -0.037 -0.074  0.048 -0.073 -0.010 -0.041 -0.055
## Item.40 -0.055  0.027 -0.002  0.044 -0.033 -0.082  0.022  0.008  0.012
## Item.41  0.015 -0.017 -0.057  0.046  0.068  0.119 -0.014 -0.051 -0.024
## Item.42  0.006  0.017  0.066 -0.020 -0.026  0.037 -0.014  0.043  0.049
## Item.43 -0.010 -0.015 -0.013 -0.023 -0.062 -0.011 -0.025  0.017  0.005
## Item.44 -0.046  0.048 -0.022 -0.030 -0.044 -0.037 -0.018  0.025  0.085
## Item.45  0.031 -0.038 -0.017 -0.027  0.016 -0.021  0.003  0.051 -0.019
## Item.46  0.007  0.079  0.014  0.019 -0.051 -0.030  0.042 -0.002  0.073
## Item.47  0.030 -0.021  0.034  0.041 -0.045  0.006  0.070  0.019 -0.049
## Item.48  0.079  0.093 -0.023 -0.009 -0.097 -0.031 -0.089 -0.014  0.085
## Item.49 -0.008  0.015 -0.031  0.031  0.022 -0.110  0.074  0.044  0.008
## Item.50 -0.031 -0.014  0.017  0.017 -0.008 -0.044  0.001  0.100  0.057
##         Item.10 Item.11 Item.12 Item.13 Item.14 Item.15 Item.16 Item.17
## Item.1   -0.074   0.007   0.031  -0.061  -0.006  -0.001  -0.033  -0.001
## Item.2   -0.008  -0.004  -0.034   0.004  -0.016  -0.005   0.004  -0.026
## Item.3   -0.018  -0.039   0.012  -0.040   0.052   0.057   0.082  -0.083
## Item.4    0.031  -0.004   0.011   0.036   0.131  -0.023  -0.029  -0.010
## Item.5    0.051  -0.013   0.002   0.096   0.029   0.035   0.053   0.049
```

```
## Item.6    0.014   0.092  -0.006  -0.062   0.026   0.037  -0.011   0.020
## Item.7    0.006   0.009   0.016  -0.009   0.001  -0.052   0.032  -0.062
## Item.8    0.003   0.000  -0.034   0.034   0.010  -0.051  -0.010  -0.062
## Item.9   -0.005   0.004   0.005   0.012   0.037   0.000  -0.007   0.005
## Item.10   0.723  -0.008  -0.016  -0.027  -0.016   0.006   0.022   0.000
## Item.11  -0.008   0.869  -0.002   0.030   0.010  -0.095   0.049   0.002
## Item.12  -0.016  -0.002   0.731   0.013  -0.021   0.049  -0.026  -0.014
## Item.13  -0.027   0.030   0.013   0.763   0.070  -0.073  -0.031  -0.016
## Item.14  -0.016   0.010  -0.021   0.070   0.762  -0.007  -0.049  -0.042
## Item.15   0.006  -0.095   0.049  -0.073  -0.007   0.875   0.026  -0.013
## Item.16   0.022   0.049  -0.026  -0.031  -0.049   0.026   1.095  -0.001
## Item.17   0.000   0.002  -0.014  -0.016  -0.042  -0.013  -0.001   0.866
## Item.18  -0.001  -0.009  -0.056   0.032  -0.032   0.030  -0.056   0.064
## Item.19   0.058  -0.035  -0.029  -0.016  -0.008   0.022  -0.018   0.033
## Item.20  -0.036   0.018   0.032   0.055   0.001  -0.037  -0.035   0.019
## Item.21  -0.026  -0.033   0.021  -0.013   0.022  -0.021  -0.019  -0.047
## Item.22  -0.039   0.004   0.034   0.014   0.042  -0.002  -0.046   0.041
## Item.23   0.066   0.017   0.028  -0.032  -0.029  -0.021   0.022   0.057
## Item.24  -0.007   0.015  -0.069   0.003  -0.001  -0.020  -0.003  -0.033
## Item.25   0.020   0.002  -0.018   0.075   0.005  -0.007   0.001   0.045
## Item.26   0.032   0.019  -0.111  -0.061   0.024  -0.011  -0.021   0.032
## Item.27  -0.016  -0.039   0.070   0.065   0.047  -0.003   0.044  -0.019
## Item.28  -0.040  -0.080  -0.006  -0.008  -0.082   0.054  -0.016   0.030
## Item.29   0.008  -0.002  -0.015  -0.032  -0.019   0.007  -0.056  -0.085
## Item.30   0.036   0.043   0.094   0.036   0.007  -0.019   0.057  -0.029
## Item.31   0.025  -0.004  -0.049  -0.019  -0.021  -0.022   0.016   0.033
## Item.32  -0.017  -0.011   0.022  -0.030  -0.014   0.074  -0.003   0.002
## Item.33   0.007  -0.037  -0.021  -0.004  -0.013   0.008  -0.005   0.048
## Item.34   0.053   0.040   0.011   0.017   0.013  -0.012   0.005  -0.017
## Item.35  -0.002  -0.019  -0.057   0.008   0.058  -0.020   0.052   0.060
## Item.36  -0.004  -0.011   0.023  -0.056   0.004  -0.005  -0.053  -0.037
## Item.37   0.055  -0.020   0.069   0.025   0.064   0.071  -0.011   0.027
## Item.38   0.056  -0.007   0.033   0.041   0.063  -0.048   0.113  -0.064
## Item.39  -0.047  -0.070  -0.108  -0.006  -0.003  -0.005  -0.052   0.036
## Item.40   0.046   0.072   0.022  -0.058  -0.060  -0.039   0.044   0.020
## Item.41   0.004   0.018  -0.025   0.043   0.033   0.032   0.088  -0.049
## Item.42   0.027  -0.053  -0.025  -0.027   0.000   0.123  -0.066   0.027
## Item.43   0.016   0.018  -0.016   0.004   0.036  -0.050  -0.045  -0.042
## Item.44   0.002   0.021  -0.018  -0.018   0.020   0.048   0.076  -0.067
## Item.45  -0.021  -0.013   0.010   0.021   0.058   0.036   0.039  -0.026
## Item.46  -0.007   0.033  -0.020   0.064  -0.070  -0.064   0.047  -0.006
## Item.47  -0.011  -0.076  -0.020  -0.042  -0.049  -0.005   0.006   0.001
## Item.48  -0.032   0.076   0.065  -0.024   0.051   0.038   0.037   0.054
## Item.49  -0.001  -0.042  -0.022  -0.014   0.063   0.025   0.067  -0.013
## Item.50   0.064   0.030  -0.077   0.014   0.034  -0.046   0.066   0.013
##         Item.18 Item.19 Item.20 Item.21 Item.22 Item.23 Item.24 Item.25
## Item.1    0.031   0.071  -0.029   0.003  -0.013   0.018   0.026   0.007
## Item.2   -0.081  -0.087   0.005  -0.003  -0.057   0.026  -0.045   0.006
## Item.3   -0.048   0.046  -0.054   0.053   0.003   0.034   0.058   0.004
## Item.4   -0.008   0.037  -0.052   0.046   0.065   0.019  -0.013   0.004
## Item.5    0.014   0.090  -0.014   0.002   0.017  -0.070  -0.081   0.063
## Item.6   -0.088  -0.042  -0.069  -0.017   0.037  -0.060   0.007  -0.017
## Item.7    0.031  -0.012   0.009  -0.002   0.055   0.006   0.060   0.012
## Item.8   -0.005  -0.018  -0.038   0.033  -0.093   0.057  -0.003   0.075
## Item.9    0.068  -0.040  -0.003   0.030  -0.046   0.056   0.042  -0.028
## Item.10  -0.001   0.058  -0.036  -0.026  -0.039   0.066  -0.007   0.020
## Item.11  -0.009  -0.035   0.018  -0.033   0.004   0.017   0.015   0.002
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## Item.12  -0.056  -0.029   0.032   0.021   0.034   0.028  -0.069  -0.018
## Item.13   0.032  -0.016   0.055  -0.013   0.014  -0.032   0.003   0.075
## Item.14  -0.032  -0.008   0.001   0.022   0.042  -0.029  -0.001   0.005
## Item.15   0.030   0.022  -0.037  -0.021  -0.002  -0.021  -0.020  -0.007
## Item.16  -0.056  -0.018  -0.035  -0.019  -0.046   0.022  -0.003   0.001
## Item.17   0.064   0.033   0.019  -0.047   0.041   0.057  -0.033   0.045
## Item.18   0.802   0.051   0.062  -0.001   0.043   0.014   0.052   0.056
## Item.19   0.051   0.899  -0.008  -0.028  -0.005  -0.041  -0.008   0.045
## Item.20   0.062  -0.008   0.721  -0.045   0.049  -0.012  -0.035   0.033
## Item.21  -0.001  -0.028  -0.045   0.666   0.028   0.021  -0.054   0.017
## Item.22   0.043  -0.005   0.049   0.028   1.001  -0.011  -0.023   0.033
## Item.23   0.014  -0.041  -0.012   0.021  -0.011   0.732  -0.057   0.070
## Item.24   0.052  -0.008  -0.035  -0.054  -0.023  -0.057   0.882  -0.057
## Item.25   0.056   0.045   0.033   0.017   0.033   0.070  -0.057   0.864
## Item.26  -0.005  -0.013  -0.043  -0.091   0.001  -0.044  -0.058  -0.006
## Item.27  -0.005  -0.076  -0.019   0.015  -0.014  -0.070  -0.053  -0.025
## Item.28   0.014  -0.010  -0.048   0.042  -0.032  -0.035  -0.035   0.041
## Item.29  -0.011  -0.063   0.012   0.029   0.041  -0.021   0.031   0.003
## Item.30   0.032   0.016   0.037  -0.017   0.050  -0.009   0.027  -0.002
## Item.31   0.010  -0.068  -0.022  -0.023  -0.007   0.032  -0.009   0.015
## Item.32  -0.038  -0.020  -0.006  -0.045  -0.037   0.018   0.004  -0.068
## Item.33  -0.008   0.083   0.004  -0.049   0.028  -0.006  -0.034  -0.011
## Item.34   0.055   0.028   0.102  -0.022   0.038   0.009  -0.057  -0.008
## Item.35  -0.039   0.078  -0.003  -0.004   0.047   0.002   0.024   0.033
## Item.36  -0.015  -0.071  -0.025   0.112  -0.065   0.017   0.103   0.003
## Item.37   0.019   0.052   0.046  -0.003  -0.064  -0.017   0.018   0.009
## Item.38  -0.053  -0.011   0.005  -0.015  -0.062   0.011   0.046  -0.067
## Item.39   0.040   0.023   0.011   0.030   0.093   0.007   0.005  -0.018
## Item.40   0.013   0.004  -0.024   0.025   0.022   0.065  -0.047  -0.014
## Item.41  -0.004  -0.020  -0.063   0.008  -0.017   0.050  -0.075   0.040
## Item.42   0.020  -0.010   0.064   0.038  -0.014  -0.047  -0.059   0.110
## Item.43  -0.009  -0.052   0.003  -0.006   0.006   0.082  -0.014  -0.043
## Item.44  -0.083  -0.027   0.090  -0.018  -0.101   0.017   0.015   0.128
## Item.45  -0.019   0.031  -0.032  -0.004   0.037  -0.044  -0.025  -0.025
## Item.46  -0.027   0.013   0.006  -0.037   0.040  -0.011  -0.028  -0.048
## Item.47   0.006  -0.035  -0.051  -0.073  -0.063  -0.033  -0.005  -0.023
## Item.48  -0.027  -0.058  -0.044   0.034  -0.002  -0.022  -0.039   0.072
## Item.49   0.006  -0.015   0.037   0.025  -0.004   0.022  -0.001   0.011
## Item.50  -0.008   0.035  -0.043   0.035  -0.076   0.030   0.032   0.067
##          Item.26 Item.27 Item.28 Item.29 Item.30 Item.31 Item.32 Item.33
## Item.1    0.002  -0.075  -0.025  -0.044   0.019  -0.040   0.026   0.008
## Item.2   -0.004  -0.017  -0.017   0.057  -0.004  -0.021  -0.020  -0.016
## Item.3   -0.031   0.015   0.126   0.029   0.019  -0.002   0.042   0.015
## Item.4    0.050   0.067  -0.051   0.052  -0.054   0.043   0.011  -0.023
## Item.5    0.021   0.019   0.016  -0.009   0.062   0.042  -0.010  -0.014
## Item.6    0.019  -0.074   0.021   0.060   0.051   0.025  -0.005  -0.100
## Item.7   -0.106  -0.040   0.015   0.029   0.040  -0.025   0.049  -0.042
## Item.8   -0.017  -0.070   0.014   0.019   0.072   0.020   0.066  -0.061
## Item.9    0.053   0.032  -0.064  -0.014  -0.050   0.023   0.005  -0.082
## Item.10   0.032  -0.016  -0.040   0.008   0.036   0.025  -0.017   0.007
## Item.11   0.019  -0.039  -0.080  -0.002   0.043  -0.004  -0.011  -0.037
## Item.12  -0.111   0.070  -0.006  -0.015   0.094  -0.049   0.022  -0.021
## Item.13  -0.061   0.065  -0.008  -0.032   0.036  -0.019  -0.030  -0.004
## Item.14   0.024   0.047  -0.082  -0.019   0.007  -0.021  -0.014  -0.013
## Item.15  -0.011  -0.003   0.054   0.007  -0.019  -0.022   0.074   0.008
## Item.16  -0.021   0.044  -0.016  -0.056   0.057   0.016  -0.003  -0.005
## Item.17   0.032  -0.019   0.030  -0.085  -0.029   0.033   0.002   0.048
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## Item.18  -0.005  -0.005   0.014  -0.011   0.032   0.010  -0.038  -0.008
## Item.19  -0.013  -0.076  -0.010  -0.063   0.016  -0.068  -0.020   0.083
## Item.20  -0.043  -0.019  -0.048   0.012   0.037  -0.022  -0.006   0.004
## Item.21  -0.091   0.015   0.042   0.029  -0.017  -0.023  -0.045  -0.049
## Item.22   0.001  -0.014  -0.032   0.041   0.050  -0.007  -0.037   0.028
## Item.23  -0.044  -0.070  -0.035  -0.021  -0.009   0.032   0.018  -0.006
## Item.24  -0.058  -0.053  -0.035   0.031   0.027  -0.009   0.004  -0.034
## Item.25  -0.006  -0.025   0.041   0.003  -0.002   0.015  -0.068  -0.011
## Item.26   1.114   0.066   0.010  -0.019  -0.038  -0.002   0.013  -0.059
## Item.27   0.066   0.911  -0.095   0.048   0.009   0.024  -0.003   0.002
## Item.28   0.010  -0.095   0.881   0.025  -0.049   0.031   0.023   0.019
## Item.29  -0.019   0.048   0.025   0.742   0.006   0.007   0.018  -0.036
## Item.30  -0.038   0.009  -0.049   0.006   0.732   0.052  -0.011   0.026
## Item.31  -0.002   0.024   0.031   0.007   0.052   0.439  -0.017   0.023
## Item.32   0.013  -0.003   0.023   0.018  -0.011  -0.017   0.494   0.031
## Item.33  -0.059   0.002   0.019  -0.036   0.026   0.023   0.031   0.567
## Item.34   0.023   0.009  -0.024   0.020  -0.078   0.000   0.038  -0.045
## Item.35   0.095   0.027  -0.005   0.006  -0.031  -0.010   0.067  -0.008
## Item.36   0.061   0.060   0.058  -0.057   0.048  -0.048   0.066  -0.024
## Item.37  -0.049  -0.051   0.083   0.014  -0.001  -0.006   0.017  -0.021
## Item.38  -0.119  -0.030  -0.042   0.032   0.059  -0.028   0.024  -0.010
## Item.39   0.069  -0.054   0.081  -0.018  -0.058   0.002   0.001  -0.018
## Item.40   0.021   0.027  -0.055  -0.030  -0.029   0.031  -0.015   0.050
## Item.41   0.037   0.021  -0.101  -0.071  -0.010   0.028   0.068  -0.008
## Item.42  -0.088  -0.035   0.073  -0.026  -0.032   0.039   0.022  -0.037
## Item.43   0.054  -0.057   0.028  -0.004   0.077   0.030  -0.041   0.033
## Item.44   0.018   0.044   0.041  -0.017  -0.086  -0.007   0.039  -0.008
## Item.45   0.034   0.068  -0.048  -0.003   0.031  -0.032   0.019  -0.006
## Item.46   0.004   0.051  -0.012   0.012  -0.035   0.034   0.008   0.033
## Item.47  -0.039  -0.058  -0.060  -0.028  -0.027   0.033   0.021   0.016
## Item.48   0.039  -0.010  -0.012  -0.029  -0.053  -0.059  -0.004  -0.043
## Item.49  -0.018   0.076   0.054   0.078   0.004   0.025   0.023   0.008
## Item.50  -0.002   0.057   0.034   0.037   0.039   0.018   0.045   0.005
##         Item.34 Item.35 Item.36 Item.37 Item.38 Item.39 Item.40 Item.41
## Item.1    0.031   0.020  -0.037   0.048  -0.014   0.001  -0.055   0.015
## Item.2   -0.120  -0.061  -0.029   0.035   0.002  -0.054   0.027  -0.017
## Item.3   -0.134   0.013  -0.040  -0.019   0.010  -0.037  -0.002  -0.057
## Item.4   -0.035   0.049  -0.071  -0.001  -0.060  -0.074   0.044   0.046
## Item.5    0.077   0.004  -0.055   0.160   0.021   0.048  -0.033   0.068
## Item.6   -0.069   0.031  -0.064  -0.008   0.023  -0.073  -0.082   0.119
## Item.7    0.014   0.074   0.001   0.017   0.083  -0.010   0.022  -0.014
## Item.8   -0.023  -0.064   0.002   0.020   0.004  -0.041   0.008  -0.051
## Item.9    0.026  -0.011  -0.011   0.096   0.021  -0.055   0.012  -0.024
## Item.10   0.053  -0.002  -0.004   0.055   0.056  -0.047   0.046   0.004
## Item.11   0.040  -0.019  -0.011  -0.020  -0.007  -0.070   0.072   0.018
## Item.12   0.011  -0.057   0.023   0.069   0.033  -0.108   0.022  -0.025
## Item.13   0.017   0.008  -0.056   0.025   0.041  -0.006  -0.058   0.043
## Item.14   0.013   0.058   0.004   0.064   0.063  -0.003  -0.060   0.033
## Item.15  -0.012  -0.020  -0.005   0.071  -0.048  -0.005  -0.039   0.032
## Item.16   0.005   0.052  -0.053  -0.011   0.113  -0.052   0.044   0.088
## Item.17  -0.017   0.060  -0.037   0.027  -0.064   0.036   0.020  -0.049
## Item.18   0.055  -0.039  -0.015   0.019  -0.053   0.040   0.013  -0.004
## Item.19   0.028   0.078  -0.071   0.052  -0.011   0.023   0.004  -0.020
## Item.20   0.102  -0.003  -0.025   0.046   0.005   0.011  -0.024  -0.063
## Item.21  -0.022  -0.004   0.112  -0.003  -0.015   0.030   0.025   0.008
## Item.22   0.038   0.047  -0.065  -0.064  -0.062   0.093   0.022  -0.017
## Item.23   0.009   0.002   0.017  -0.017   0.011   0.007   0.065   0.050
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## Item.24  -0.057   0.024   0.103   0.018   0.046   0.005  -0.047  -0.075
## Item.25  -0.008   0.033   0.003   0.009  -0.067  -0.018  -0.014   0.040
## Item.26   0.023   0.095   0.061  -0.049  -0.119   0.069   0.021   0.037
## Item.27   0.009   0.027   0.060  -0.051  -0.030  -0.054   0.027   0.021
## Item.28  -0.024  -0.005   0.058   0.083  -0.042   0.081  -0.055  -0.101
## Item.29   0.020   0.006  -0.057   0.014   0.032  -0.018  -0.030  -0.071
## Item.30  -0.078  -0.031   0.048  -0.001   0.059  -0.058  -0.029  -0.010
## Item.31   0.000  -0.010  -0.048  -0.006  -0.028   0.002   0.031   0.028
## Item.32   0.038   0.067   0.066   0.017   0.024   0.001  -0.015   0.068
## Item.33  -0.045  -0.008  -0.024  -0.021  -0.010  -0.018   0.050  -0.008
## Item.34   0.980   0.051  -0.042   0.031   0.039   0.086  -0.054   0.002
## Item.35   0.051   0.888   0.008   0.029   0.042   0.032   0.033   0.072
## Item.36  -0.042   0.008   1.161  -0.022   0.033  -0.015   0.037  -0.138
## Item.37   0.031   0.029  -0.022   0.909   0.048  -0.094   0.000   0.081
## Item.38   0.039   0.042   0.033   0.048   0.869  -0.021  -0.011   0.033
## Item.39   0.086   0.032  -0.015  -0.094  -0.021   1.072  -0.041   0.069
## Item.40  -0.054   0.033   0.037   0.000  -0.011  -0.041   0.734   0.004
## Item.41   0.002   0.072  -0.138   0.081   0.033   0.069   0.004   1.230
## Item.42   0.040  -0.042  -0.021   0.127  -0.003   0.040   0.033  -0.035
## Item.43   0.048  -0.003   0.008   0.013  -0.028   0.008  -0.008   0.020
## Item.44  -0.012  -0.027  -0.013   0.031   0.053  -0.018  -0.006   0.015
## Item.45   0.019   0.022   0.035  -0.077   0.031   0.003   0.001   0.049
## Item.46  -0.001  -0.066  -0.037  -0.058  -0.006   0.086  -0.002  -0.087
## Item.47  -0.037  -0.043  -0.047   0.024  -0.009  -0.039  -0.026  -0.124
## Item.48   0.030   0.024  -0.071   0.040  -0.013   0.002   0.029   0.114
## Item.49   0.019   0.031   0.045   0.069   0.030  -0.001  -0.039  -0.001
## Item.50  -0.016   0.018   0.042   0.079   0.058   0.040  -0.065   0.072
##         Item.42 Item.43 Item.44 Item.45 Item.46 Item.47 Item.48 Item.49
## Item.1    0.006  -0.010  -0.046   0.031   0.007   0.030   0.079  -0.008
## Item.2    0.017  -0.015   0.048  -0.038   0.079  -0.021   0.093   0.015
## Item.3    0.066  -0.013  -0.022  -0.017   0.014   0.034  -0.023  -0.031
## Item.4   -0.020  -0.023  -0.030  -0.027   0.019   0.041  -0.009   0.031
## Item.5   -0.026  -0.062  -0.044   0.016  -0.051  -0.045  -0.097   0.022
## Item.6    0.037  -0.011  -0.037  -0.021  -0.030   0.006  -0.031  -0.110
## Item.7   -0.014  -0.025  -0.018   0.003   0.042   0.070  -0.089   0.074
## Item.8    0.043   0.017   0.025   0.051  -0.002   0.019  -0.014   0.044
## Item.9    0.049   0.005   0.085  -0.019   0.073  -0.049   0.085   0.008
## Item.10   0.027   0.016   0.002  -0.021  -0.007  -0.011  -0.032  -0.001
## Item.11  -0.053   0.018   0.021  -0.013   0.033  -0.076   0.076  -0.042
## Item.12  -0.025  -0.016  -0.018   0.010  -0.020  -0.020   0.065  -0.022
## Item.13  -0.027   0.004  -0.018   0.021   0.064  -0.042  -0.024  -0.014
## Item.14   0.000   0.036   0.020   0.058  -0.070  -0.049   0.051   0.063
## Item.15   0.123  -0.050   0.048   0.036  -0.064  -0.005   0.038   0.025
## Item.16  -0.066  -0.045   0.076   0.039   0.047   0.006   0.037   0.067
## Item.17   0.027  -0.042  -0.067  -0.026  -0.006   0.001   0.054  -0.013
## Item.18   0.020  -0.009  -0.083  -0.019  -0.027   0.006  -0.027   0.006
## Item.19  -0.010  -0.052  -0.027   0.031   0.013  -0.035  -0.058  -0.015
## Item.20   0.064   0.003   0.090  -0.032   0.006  -0.051  -0.044   0.037
## Item.21   0.038  -0.006  -0.018  -0.004  -0.037  -0.073   0.034   0.025
## Item.22  -0.014   0.006  -0.101   0.037   0.040  -0.063  -0.002  -0.004
## Item.23  -0.047   0.082   0.017  -0.044  -0.011  -0.033  -0.022   0.022
## Item.24  -0.059  -0.014   0.015  -0.025  -0.028  -0.005  -0.039  -0.001
## Item.25   0.110  -0.043   0.128  -0.025  -0.048  -0.023   0.072   0.011
## Item.26  -0.088   0.054   0.018   0.034   0.004  -0.039   0.039  -0.018
## Item.27  -0.035  -0.057   0.044   0.068   0.051  -0.058  -0.010   0.076
## Item.28   0.073   0.028   0.041  -0.048  -0.012  -0.060  -0.012   0.054
## Item.29  -0.026  -0.004  -0.017  -0.003   0.012  -0.028  -0.029   0.078
```

```
## Item.30  -0.032   0.077  -0.086   0.031  -0.035  -0.027  -0.053   0.004
## Item.31   0.039   0.030  -0.007  -0.032   0.034   0.033  -0.059   0.025
## Item.32   0.022  -0.041   0.039   0.019   0.008   0.021  -0.004   0.023
## Item.33  -0.037   0.033  -0.008  -0.006   0.033   0.016  -0.043   0.008
## Item.34   0.040   0.048  -0.012   0.019  -0.001  -0.037   0.030   0.019
## Item.35  -0.042  -0.003  -0.027   0.022  -0.066  -0.043   0.024   0.031
## Item.36  -0.021   0.008  -0.013   0.035  -0.037  -0.047  -0.071   0.045
## Item.37   0.127   0.013   0.031  -0.077  -0.058   0.024   0.040   0.069
## Item.38  -0.003  -0.028   0.053   0.031  -0.006  -0.009  -0.013   0.030
## Item.39   0.040   0.008  -0.018   0.003   0.086  -0.039   0.002  -0.001
## Item.40   0.033  -0.008  -0.006   0.001  -0.002  -0.026   0.029  -0.039
## Item.41  -0.035   0.020   0.015   0.049  -0.087  -0.124   0.114  -0.001
## Item.42   1.154  -0.072   0.087  -0.041  -0.001  -0.052   0.197  -0.011
## Item.43  -0.072   0.780   0.007  -0.017  -0.021  -0.045   0.027  -0.023
## Item.44   0.087   0.007   1.093  -0.001   0.024  -0.082  -0.048   0.083
## Item.45  -0.041  -0.017  -0.001   0.798  -0.054  -0.013   0.001   0.105
## Item.46  -0.001  -0.021   0.024  -0.054   1.048   0.028   0.017   0.001
## Item.47  -0.052  -0.045  -0.082  -0.013   0.028   0.969  -0.050   0.010
## Item.48   0.197   0.027  -0.048   0.001   0.017  -0.050   1.011  -0.029
## Item.49  -0.011  -0.023   0.083   0.105   0.001   0.010  -0.029   0.656
## Item.50  -0.113   0.027  -0.009  -0.030  -0.088  -0.040   0.028   0.013
##         Item.50
## Item.1   -0.031
## Item.2   -0.014
## Item.3    0.017
## Item.4    0.017
## Item.5   -0.008
## Item.6   -0.044
## Item.7    0.001
## Item.8    0.100
## Item.9    0.057
## Item.10   0.064
## Item.11   0.030
## Item.12  -0.077
## Item.13   0.014
## Item.14   0.034
## Item.15  -0.046
## Item.16   0.066
## Item.17   0.013
## Item.18  -0.008
## Item.19   0.035
## Item.20  -0.043
## Item.21   0.035
## Item.22  -0.076
## Item.23   0.030
## Item.24   0.032
## Item.25   0.067
## Item.26  -0.002
## Item.27   0.057
## Item.28   0.034
## Item.29   0.037
## Item.30   0.039
## Item.31   0.018
## Item.32   0.045
## Item.33   0.005
## Item.34  -0.016
## Item.35   0.018
```

```
## Item.36   0.042
## Item.37   0.079
## Item.38   0.058
## Item.39   0.040
## Item.40  -0.065
## Item.41   0.072
## Item.42  -0.113
## Item.43   0.027
## Item.44  -0.009
## Item.45  -0.030
## Item.46  -0.088
## Item.47  -0.040
## Item.48   0.028
## Item.49   0.013
## Item.50   0.882
```

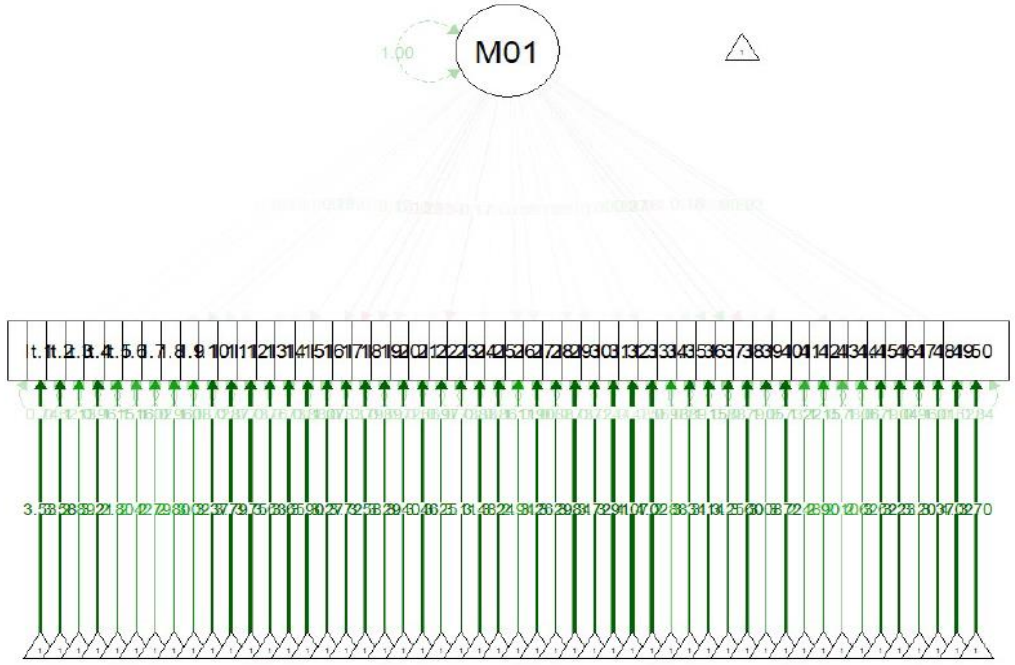
Appendix .6

Model.1 Output

```
## lavaan (0.5-23.1097) converged normally after  50 iterations
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML      Robust
##   Minimum Function Test Statistic             1317.207    1410.361
##   Degrees of freedom                              1175        1175
##   P-value (Chi-square)                           0.002       0.000
##   Scaling correction factor                                  0.934
##     for the Yuan-Bentler correction (Mplus variant)
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1399.190    1401.724
##   Degrees of freedom                              1225        1225
##   P-value                                        0.000       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.184       0.000
##   Tucker-Lewis Index (TLI)                       0.149      -0.388
##
##   Robust Comparative Fit Index (CFI)                         0.000
##   Robust Tucker-Lewis Index (TLI)                           -0.299
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -31265.808  -31265.808
##   Scaling correction factor                                  1.427
##     for the MLR correction
##   Loglikelihood unrestricted model (H1)     -30607.205  -30607.205
##   Scaling correction factor                                  0.990
##     for the MLR correction
##
##   Number of free parameters                       150         150
##   Akaike (AIC)                                62831.617   62831.617
##   Bayesian (BIC)                              63452.922   63452.922
##   Sample-size adjusted Bayesian (BIC)         62976.858   62976.858
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.016       0.021
##   90 Percent Confidence Interval          0.010  0.021       0.016  0.025
##   P-value RMSEA <= 0.05                          1.000       1.000
##
##   Robust RMSEA                                               0.020
##   90 Percent Confidence Interval                             0.016  0.024
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.045       0.045
##
## Parameter Estimates:
##
##   Information                                 Observed
```

Appendix .7

Path Analysis for Model.1



###

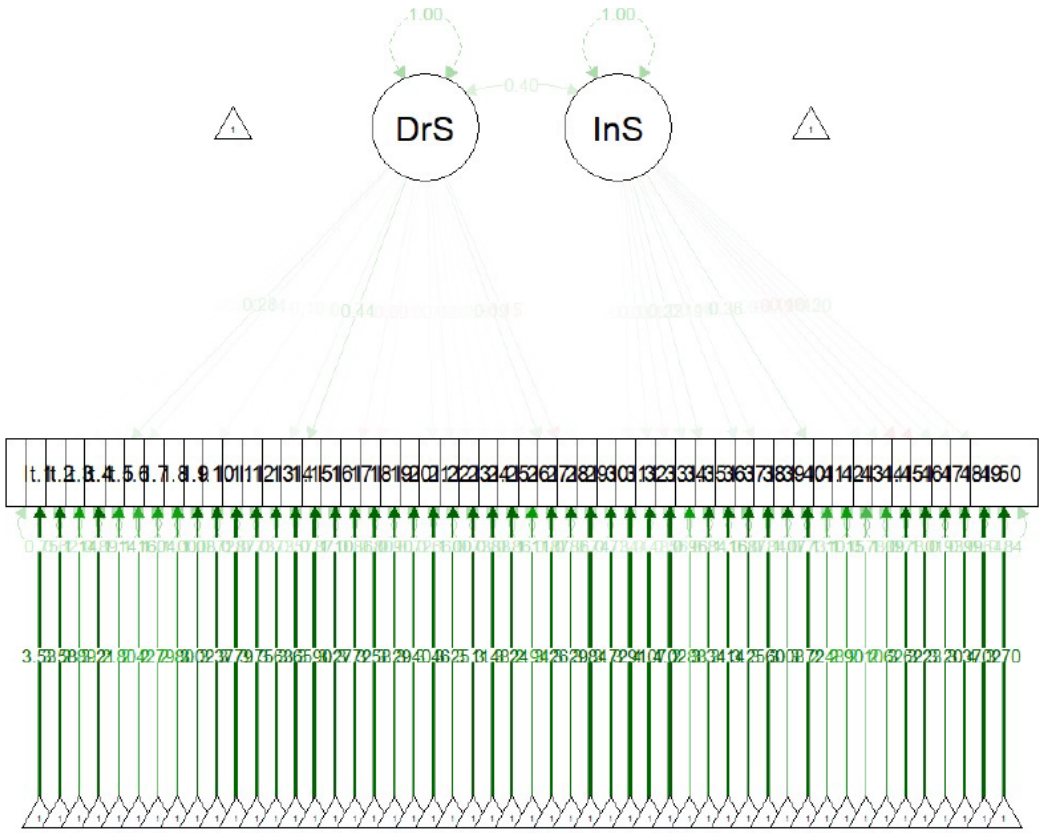
Appendix .8

Model.2 Output

```
## lavaan (0.5-23.1097) converged normally after  49 iterations
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML      Robust
##   Minimum Function Test Statistic             1313.396    1347.248
##   Degrees of freedom                              1174        1174
##   P-value (Chi-square)                           0.003       0.000
##   Scaling correction factor                                  0.975
##     for the Yuan-Bentler correction (Mplus variant)
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1399.190    1401.724
##   Degrees of freedom                              1225        1225
##   P-value                                        0.000       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.200       0.020
##   Tucker-Lewis Index (TLI)                       0.165      -0.023
##
##   Robust Comparative Fit Index (CFI)                         0.043
##   Robust Tucker-Lewis Index (TLI)                            0.001
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -31263.903  -31263.903
##   Scaling correction factor                                  1.106
##     for the MLR correction
##   Loglikelihood unrestricted model (H1)     -30607.205  -30607.205
##   Scaling correction factor                                  0.990
##     for the MLR correction
##
##   Number of free parameters                       151         151
##   Akaike (AIC)                                62829.805   62829.805
##   Bayesian (BIC)                              63455.253   63455.253
##   Sample-size adjusted Bayesian (BIC)         62976.015   62976.015
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.016       0.018
##   90 Percent Confidence Interval          0.010  0.021       0.013  0.022
##   P-value RMSEA <= 0.05                          1.000       1.000
##
##   Robust RMSEA                                               0.018
##   90 Percent Confidence Interval                             0.012  0.022
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.045       0.045
##
## Parameter Estimates:
##
##   Information                                 Observed
```

Appendix .9

Path Analysis for Model.2



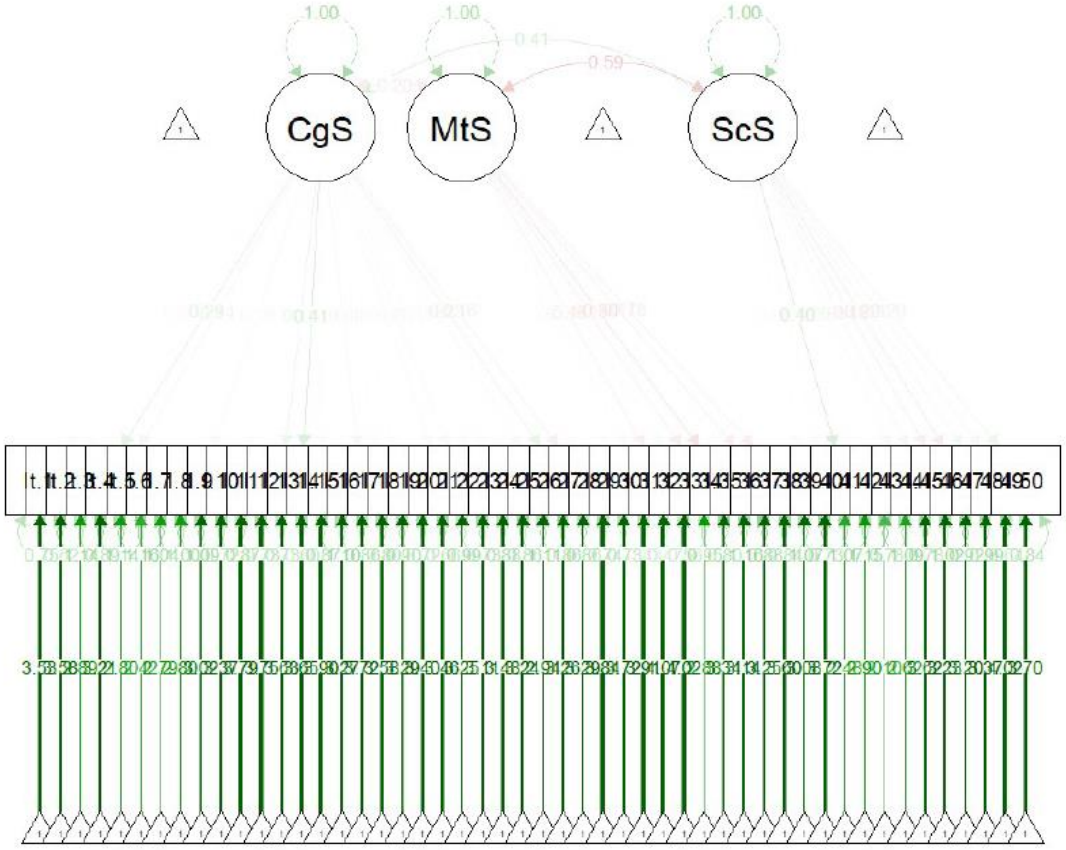
Appendix .10

Model.3 Output

```
## lavaan (0.5-23.1097) converged normally after  87 iterations
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML      Robust
##   Minimum Function Test Statistic             1310.874    1357.929
##   Degrees of freedom                              1172        1172
##   P-value (Chi-square)                           0.003       0.000
##   Scaling correction factor                                  0.965
##     for the Yuan-Bentler correction (Mplus variant)
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1399.190    1401.724
##   Degrees of freedom                              1225        1225
##   P-value                                        0.000       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.203       0.000
##   Tucker-Lewis Index (TLI)                       0.167      -0.100
##
##   Robust Comparative Fit Index (CFI)                         0.000
##   Robust Tucker-Lewis Index (TLI)                           -0.063
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -31262.642  -31262.642
##   Scaling correction factor                                  1.177
##     for the MLR correction
##   Loglikelihood unrestricted model (H1)     -30607.205  -30607.205
##   Scaling correction factor                                  0.990
##     for the MLR correction
##
##   Number of free parameters                        153         153
##   Akaike (AIC)                                62831.284   62831.284
##   Bayesian (BIC)                              63465.016   63465.016
##   Sample-size adjusted Bayesian (BIC)         62979.430   62979.430
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.016       0.018
##   90 Percent Confidence Interval          0.010  0.021       0.013  0.023
##   P-value RMSEA <= 0.05                          1.000       1.000
##
##   Robust RMSEA                                               0.018
##   90 Percent Confidence Interval                             0.013  0.022
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.045       0.045
##
## Parameter Estimates:
##
##   Information                                 Observed
```

Appendix .11

Path Analysis for Model.3



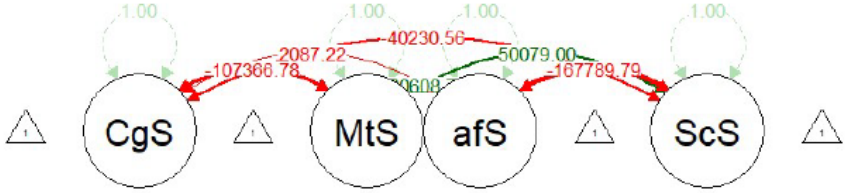
Appendix .12

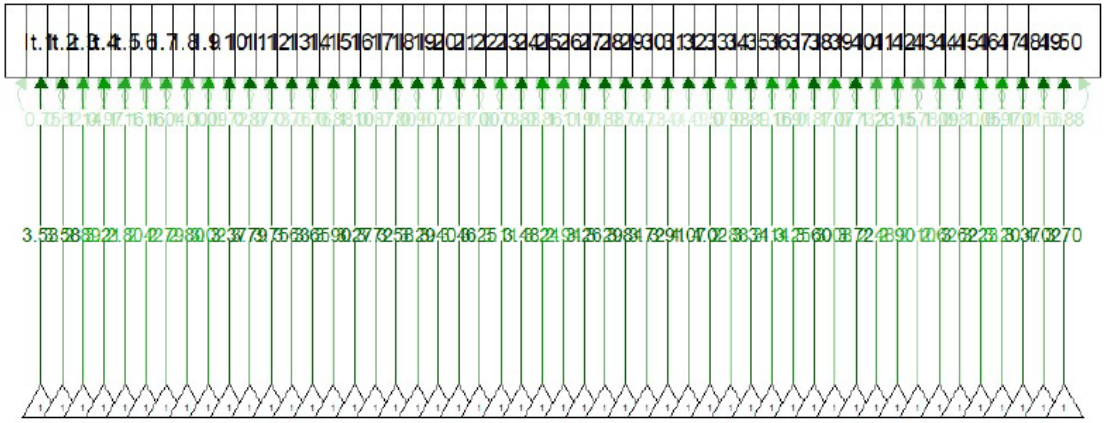
Model.4 Output

```
## ** WARNING ** lavaan (0.5-23.1097) did NOT converge after 899 iterations
## ** WARNING ** Estimates below are most likely unreliable
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML
##   Minimum Function Test Statistic                   NA
##   Degrees of freedom                                NA
##   P-value                                           NA
```

Appendix .13

Path Analysis for Model.4





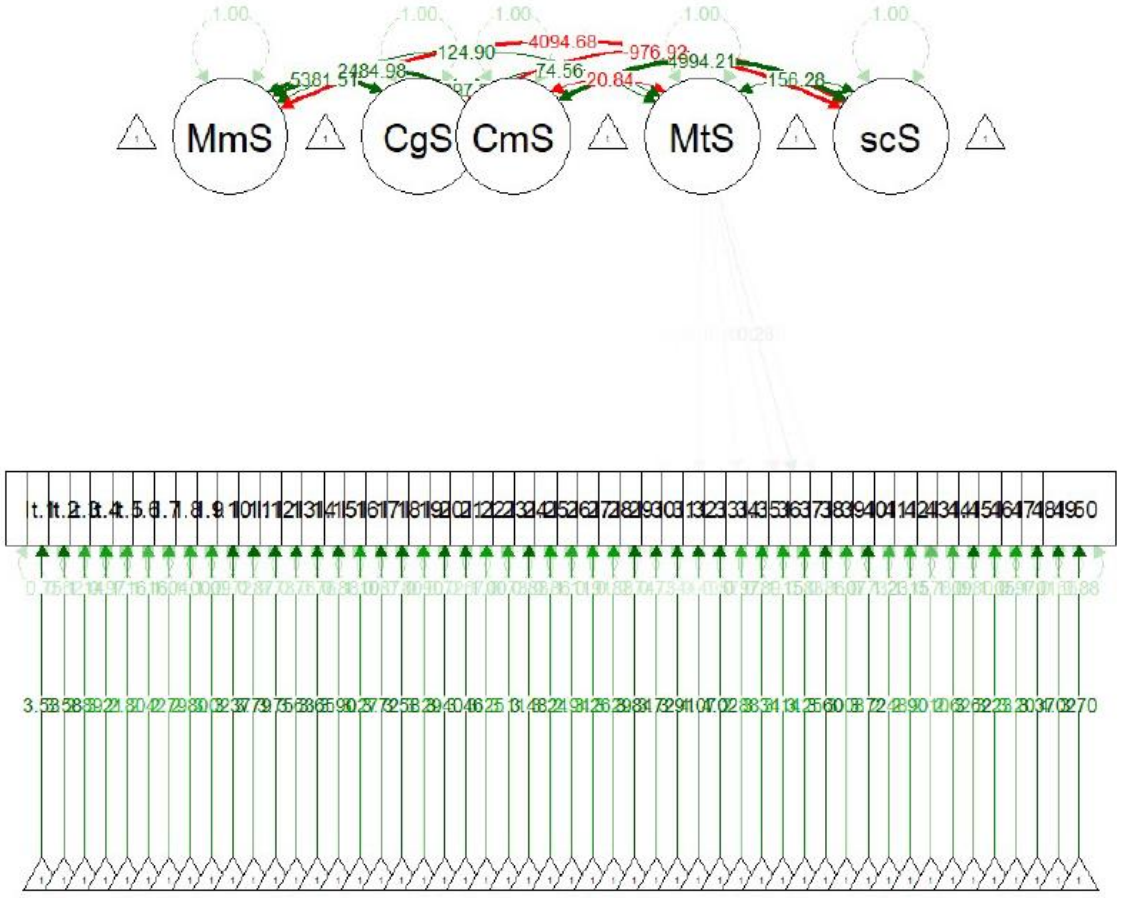
Appendix .14

Model.5 Output

```
## ** WARNING ** lavaan (0.5-23.1097) did NOT converge after 968 iterations
## ** WARNING ** Estimates below are most likely unreliable
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML
##   Minimum Function Test Statistic                   NA
##   Degrees of freedom                                NA
##   P-value                                           NA
```

Appendix .15

Path Analysis for Model.5



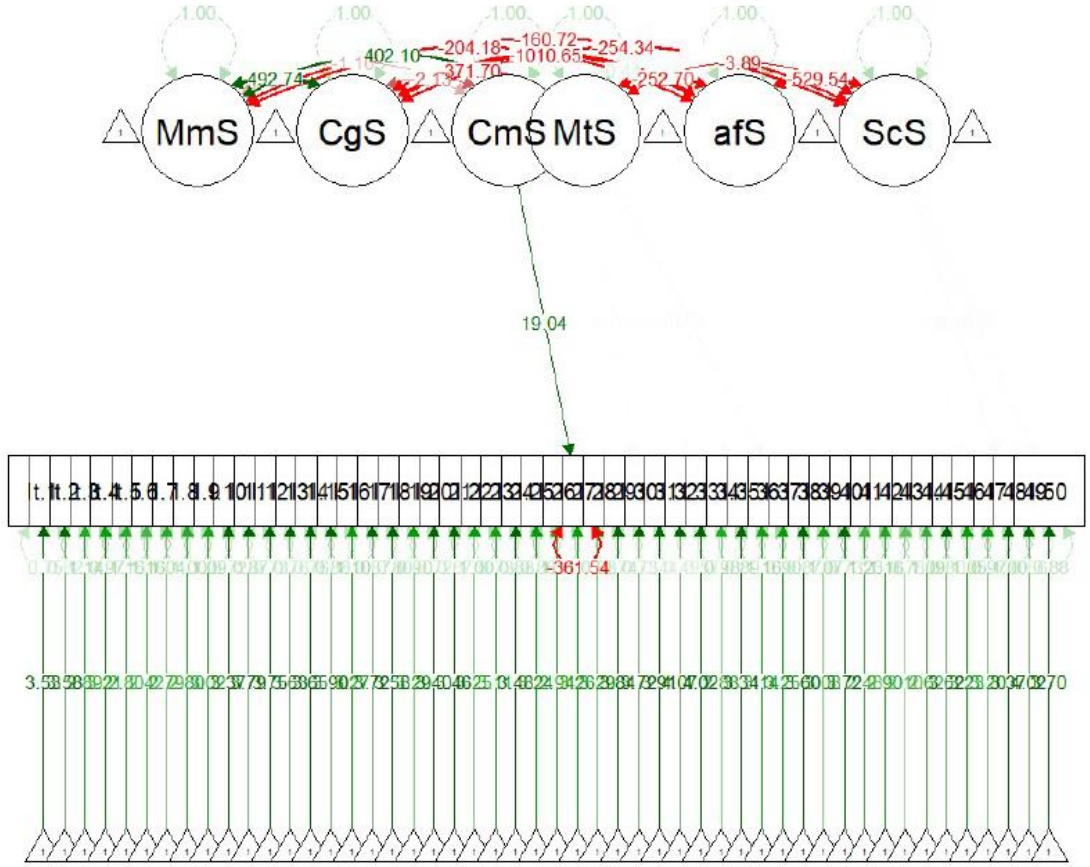
Appendix .16

Model.6 Output

```
## lavaan (0.5-23.1097) converged normally after 820 iterations
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML      Robust
##   Minimum Function Test Statistic             1259.284    1242.610
##   Degrees of freedom                              1160        1160
##   P-value (Chi-square)                           0.022       0.046
##   Scaling correction factor                                  1.013
##     for the Yuan-Bentler correction (Mplus variant)
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1399.190    1401.724
##   Degrees of freedom                              1225        1225
##   P-value                                        0.000       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.430       0.533
##   Tucker-Lewis Index (TLI)                       0.398       0.506
##
##   Robust Comparative Fit Index (CFI)                         0.525
##   Robust Tucker-Lewis Index (TLI)                            0.499
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -31236.847  -31236.847
##   Scaling correction factor                                  0.824
##     for the MLR correction
##   Loglikelihood unrestricted model (H1)     -30607.205  -30607.205
##   Scaling correction factor                                  0.990
##     for the MLR correction
##
##   Number of free parameters                        165         165
##   Akaike (AIC)                                62803.693   62803.693
##   Bayesian (BIC)                              63487.130   63487.130
##   Sample-size adjusted Bayesian (BIC)         62963.459   62963.459
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.014       0.012
##   90 Percent Confidence Interval          0.006  0.019       0.002  0.018
##   P-value RMSEA <= 0.05                          1.000       1.000
##
##   Robust RMSEA                                               0.012
##   90 Percent Confidence Interval                             0.002  0.018
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.044       0.044
##
## Parameter Estimates:
##
##   Information                                 Observed
```

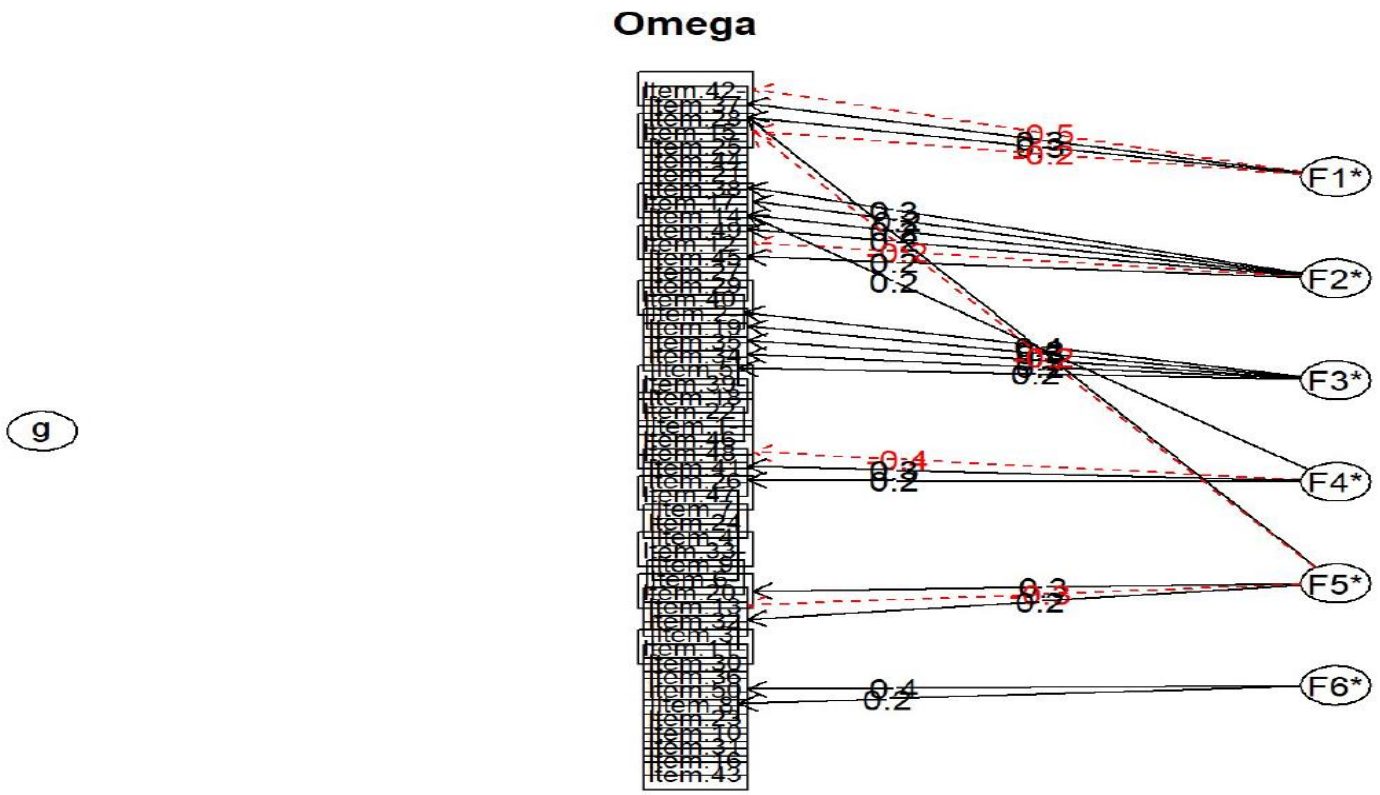
Appendix .17

Path Analysis for Model.6



Appendix .18

Model.6 Omega



Appendix .19

Model.6 Omega Table

```
## Omega
## Call: omega(m = round(cor(SILLDATA[, 2:51]), digits = 3), nfactors = 6)
## Alpha:                 0.31
## G.6:                   0.38
## Omega Hierarchical:    0.07
## Omega H asymptotic:    0.21
## Omega Total            0.36
##
## Schmid Leiman Factor loadings greater than  0.2
##              g   F1*   F2*   F3*   F4*   F5*   F6*   h2   u2   p2
## Item.1-                                          0.02 0.98 0.03
## Item.2-                     0.35                 0.14 0.86 0.04
## Item.3                                           0.05 0.95 0.01
## Item.4                                           0.03 0.97 0.06
## Item.5                      0.21                 0.07 0.93 0.07
## Item.6-                                          0.03 0.97 0.02
## Item.7                                           0.07 0.93 0.07
## Item.8                                     0.20  0.08 0.92 0.06
## Item.9                                           0.04 0.96 0.01
## Item.10                                          0.04 0.96 0.13
## Item.11-                                         0.08 0.92 0.00
## Item.12-             -0.21                       0.10 0.90 0.03
## Item.13                                -0.27     0.09 0.91 0.02
## Item.14               0.22        0.20            0.11 0.89 0.05
## Item.15-       -0.25                    -0.23     0.14 0.86 0.01
## Item.16                                          0.03 0.97 0.13
## Item.17-              0.24                       0.09 0.91 0.01
## Item.18                     0.20                 0.10 0.90 0.00
## Item.19                     0.28                 0.09 0.91 0.02
## Item.20-                               0.31      0.13 0.87 0.01
## Item.21                                          0.02 0.98 0.00
## Item.22-                                         0.08 0.92 0.02
## Item.23                                          0.06 0.94 0.02
## Item.24                                          0.04 0.96 0.05
## Item.25         0.20                             0.10 0.90 0.01
## Item.26                           0.24           0.13 0.87 0.00
## Item.27                                          0.06 0.94 0.02
## Item.28         0.25                    0.20     0.15 0.85 0.00
## Item.29                                          0.03 0.97 0.03
## Item.30                                          0.08 0.92 0.05
## Item.31                                          0.06 0.94 0.03
## Item.32                                0.22      0.08 0.92 0.03
## Item.33-                                         0.04 0.96 0.00
## Item.34                     0.23                 0.09 0.91 0.01
## Item.35                     0.23                 0.10 0.90 0.07
## Item.36                                          0.04 0.96 0.03
## Item.37         0.34                             0.17 0.83 0.03
## Item.38               0.29                       0.11 0.89 0.08
## Item.39-                   -0.20                 0.07 0.93 0.00
## Item.40-                                         0.03 0.97 0.03
## Item.41                           0.31           0.13 0.87 0.04
## Item.42-       -0.45                             0.23 0.77 0.04
## Item.43                                          0.04 0.96 0.02
## Item.44                                          0.05 0.95 0.01
## Item.45               0.20                       0.08 0.92 0.02
## Item.46-                                         0.03 0.97 0.11
## Item.47-                                         0.05 0.95 0.01
```

```
## Item.48-                          -0.38             0.21 0.79 0.04
## Item.49               0.22                          0.09 0.91 0.12
## Item.50                                          0.39 0.19 0.81 0.18
##
```

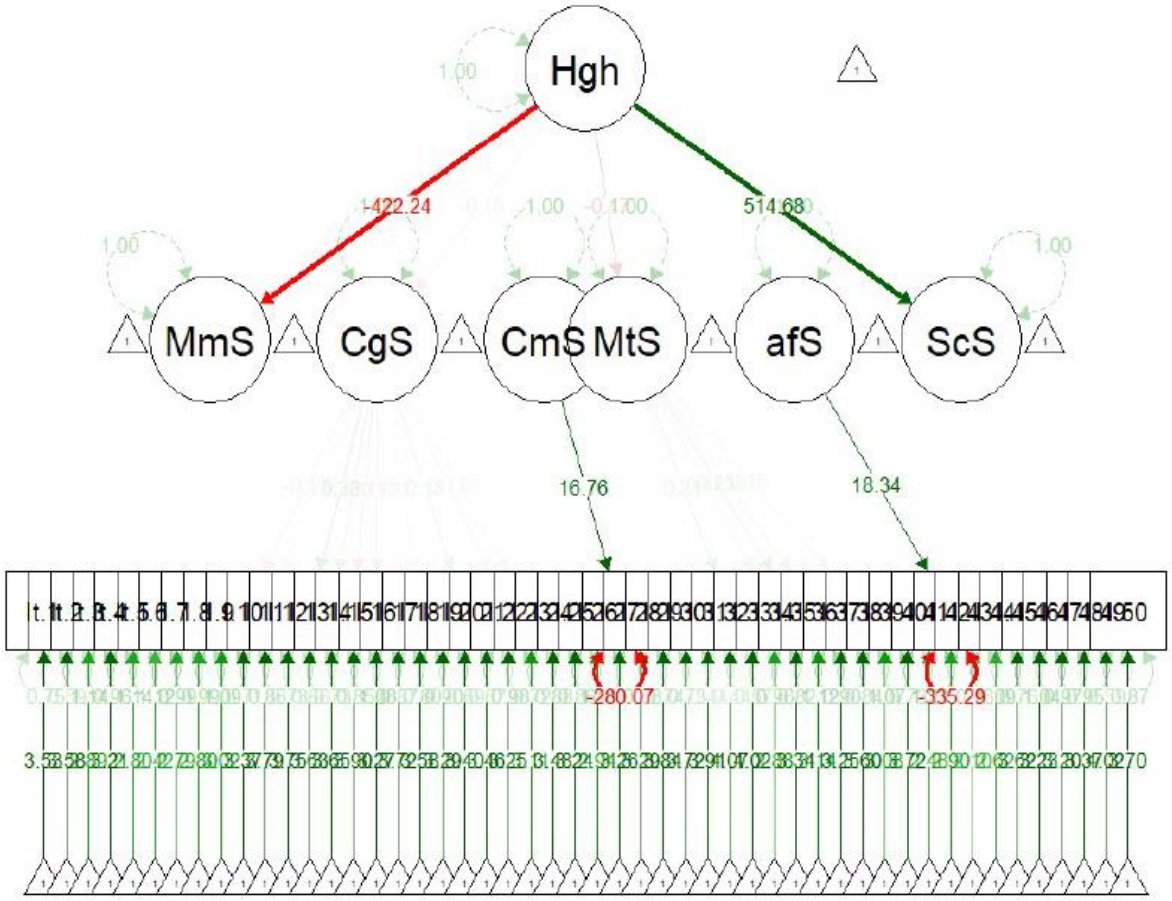
Appendix .20

Model.7 Output

```
## lavaan (0.5-23.1097) converged normally after 2696 iterations
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML      Robust
##   Minimum Function Test Statistic             1305.363          NA
##   Degrees of freedom                              1169        1169
##   P-value (Chi-square)                           0.003          NA
##   Scaling correction factor                                     NA
##     for the Yuan-Bentler correction (Mplus variant)
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             1399.190    1401.724
##   Degrees of freedom                              1225        1225
##   P-value                                        0.000       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.217          NA
##   Tucker-Lewis Index (TLI)                       0.180          NA
##
##   Robust Comparative Fit Index (CFI)                            NA
##   Robust Tucker-Lewis Index (TLI)                               NA
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -31259.886  -31259.886
##   Loglikelihood unrestricted model (H1)     -30607.205  -30607.205
##
##   Number of free parameters                        156         156
##   Akaike (AIC)                               62831.773   62831.773
##   Bayesian (BIC)                             63477.931   63477.931
##   Sample-size adjusted Bayesian (BIC)        62982.824   62982.824
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.016          NA
##   90 Percent Confidence Interval          0.010  0.021       0.000  0.000
##   P-value RMSEA <= 0.05                          1.000       0.000
##
##   Robust RMSEA                                                  NA
##   90 Percent Confidence Interval                             0.000  0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.045       0.045
##
## Parameter Estimates:
##
##   Information                                 Observed
##   Standard Errors                    Robust.huber.white
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
```

Appendix .21

Path Analysis for Model.



Appendix .22

Model.8 Output

```
## ** WARNING ** lavaan (0.5-23.1097) did NOT converge after 10000 iterations
## ** WARNING ** Estimates below are most likely unreliable
##
##   Number of observations                           465
##
##   Number of missing patterns                         1
##
##   Estimator                                         ML
##   Minimum Function Test Statistic                   NA
##   Degrees of freedom                                NA
##   P-value                                           NA
```

Appendix .23

Path Analysis for M